A STUDY ON

KNOWLEDGE & AWARENESS OF POLYCYSTIC OVARIAN SYNDROME AMONG FEMALE NON MEDICAL UNDERGRADUATE STUDENTS

This dissertation is submitted to the Department of Pharmacy, East West University in the partial fulfillment of the requirements for the Degree of Bachelor of Pharmacy.

Submitted To

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Declaration by the Research Candidate

I, **Safa Jahangir**, ID: 2013-3-70-001 hereby declare that the dissertation entitled "KNOWLEDGE & AWARENESS OF POLYCYSTIC OVARIAN SYNDROME AMONG FEMALE NON MEDICAL UNDERGRADUATE STUDENTS' submitted by me to the Department of Pharmacy, East West University and in the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy, under the supervision and guidance of **Tilka Fannana**, Senior Lecturer, Department of Pharmacy, East West University, Dhaka, Bangladesh.

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Certificate by the Chairperson

This is to certify that the dissertation entitled "KNOWLEDGE & AWARENESS OF POLYCYSTIC OVARIAN SYNDROME AMONG FEMALE NON MEDICAL UNDERGRADUATE STUDENTS'' submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy is a bonafied record of original and genuine research work carried out by Safa Jahangir, ID: 2013-3-70-001, under the supervision and guidance of Tilka Fannana, Senior Lecturer, Department of Pharmacy, East West University and no part of this project has been submitted to other degree.

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This Research paper is

Dedicated to

My Beloved Family

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1.1. Overview

PCOS is one of the most common hormonal disorders in women of reproductive age. Women with PCOS have irregular menstrual bleeding and often face difficulty getting pregnant. The syndrome occurs when levels of hormones are abnormal. The name "polycystic ovarian syndrome" refers to the appearance of small cysts along the outer edge of the enlarged ovaries of women with this condition. The exact cause of PCOS is unknown, but experts believe it is related to the production of excess amount of androgens, a group of male sex hormones. Although all women produce some androgens, too much of this type of hormone prevents ovulation. Excess androgens also disrupt the normal menstrual cycle. They may cause infertility, acne and abnormal hair growth, such as excess facial hair or male pattern baldness. Many factors may play a role in the production of androgens, and thus the development of PCOS. For instance, excess insulin may be a factor in developing PCOS. Excess insulin leads to insulin resistance, which in turn decreases one's ability to use insulin effectively. When the body cannot use insulin properly, it secretes more insulin to make glucose available to cells. The resulting excess insulin is thought to additionally boost androgen production by the ovaries. (Hignett & Kyle, 2011)

Polycystic ovary syndrome is the most common female endocrinopathy, affecting 5–10% of the female population. The overproduction of ovarian androgens leads to hirsutism, acne, anovulation and infertility. Hyperinsulinaemia, exacerbated by obesity, is often a key feature. Treatment depends on the presenting symptoms, which may often be ameliorated by weight loss where relevant. Anti-androgen preparations are used for hyperandrogenic symptoms, and clomiphene citrate (CC) is the first-line treatment for anovulation and infertility. Failure to conceive with CC can be treated in a number of ways, including the addition of insulin-lowering agents (mainly metformin), low-dose gonadotrophin therapy or surgically by laparoscopic ovarian drilling. Although the exact etiology of PCOS is not known, the therapeutic alternatives provide reasonably successful symptomatic treatment.

The definition accepted by most of the authors is the following: presence of ≥10 cysts measuring 2–8 mm in diameter arranged peripherally around a dense core of stroma or scattered through an increased amount of stroma. It includes the two main histological features of PCO, namely the excessive number of follicles, also termed multifollicularity, and stromal hypertrophy. (Adams et al., 1985)

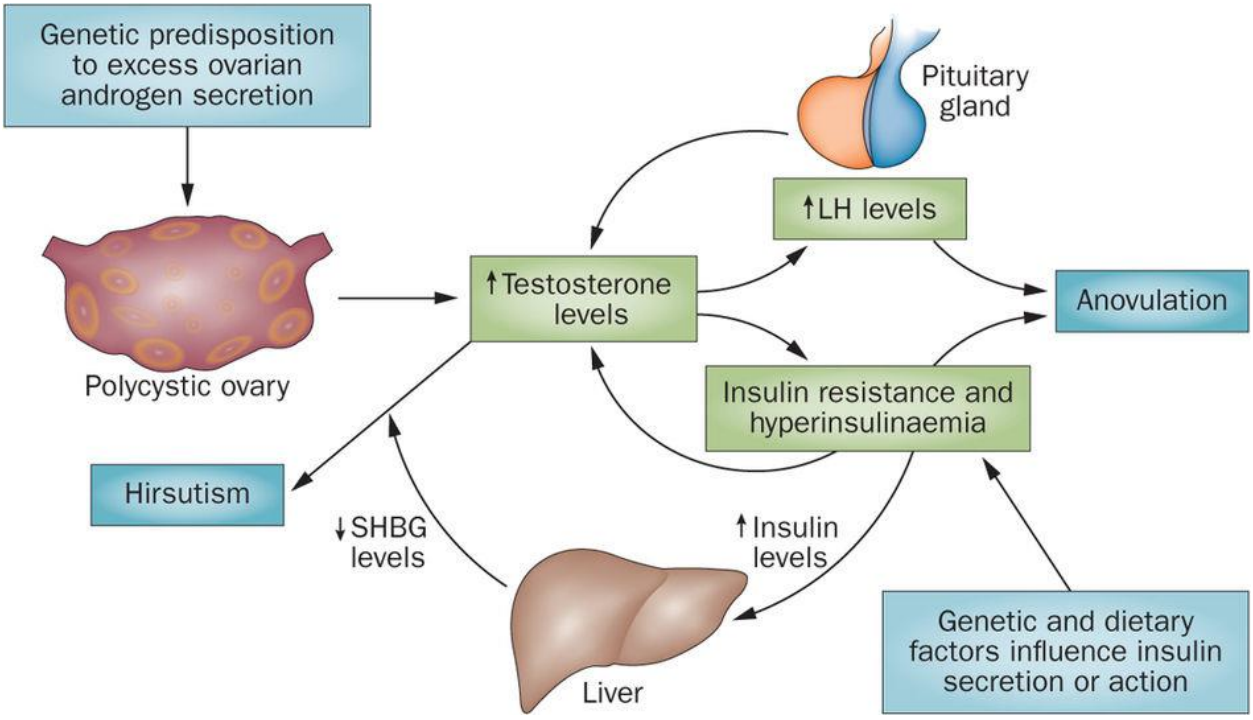

Figure 1.1. Overview of PCOS (Jayasena & Franks, 2014)

1.2. Normal Ovary

The ovaries are the organs in a woman's reproductive system that produce ova. They are almond-shaped and about 3.5 cm long. The ovaries are located deep in a woman's pelvis, on both sides of the uterus, close to the ends of the Fallopian tubes.

The ovaries are made up of 3 different types of cells:

- **Epithelial cells** make up the outer layer covering the ovary (epithelium).
- **Germ cells** are inside the ovary. They develop into eggs.
- **Stromal cells** form the supportive or connective tissues of the ovary (stroma).

Each ovary is surrounded by a thin layer of tissue called the capsule. The ovaries have 2 main functions. They produce mature eggs. They also make the female sex hormones, which control reproduction and sexual development.

Estrogen is responsible for the development of secondary sex characteristics, such as the growth of breasts. The ovaries are the main source of estrogen in sexually mature women.

Progesterone prepares the body for conception by causing the buildup of the uterine lining (endometrium) and other changes.

Each month during ovulation, an ovary releases a mature egg. The egg travels down the Fallopian tube to the uterus. If it is fertilized by a sperm, the egg implants into the lining of the uterus and begins to develop into a fetus. If the egg is not fertilized, it is shed from the body along with the lining of the uterus during menstruation.

During menopause, the ovaries stop releasing eggs and producing sex hormones. (Katz, 2007)

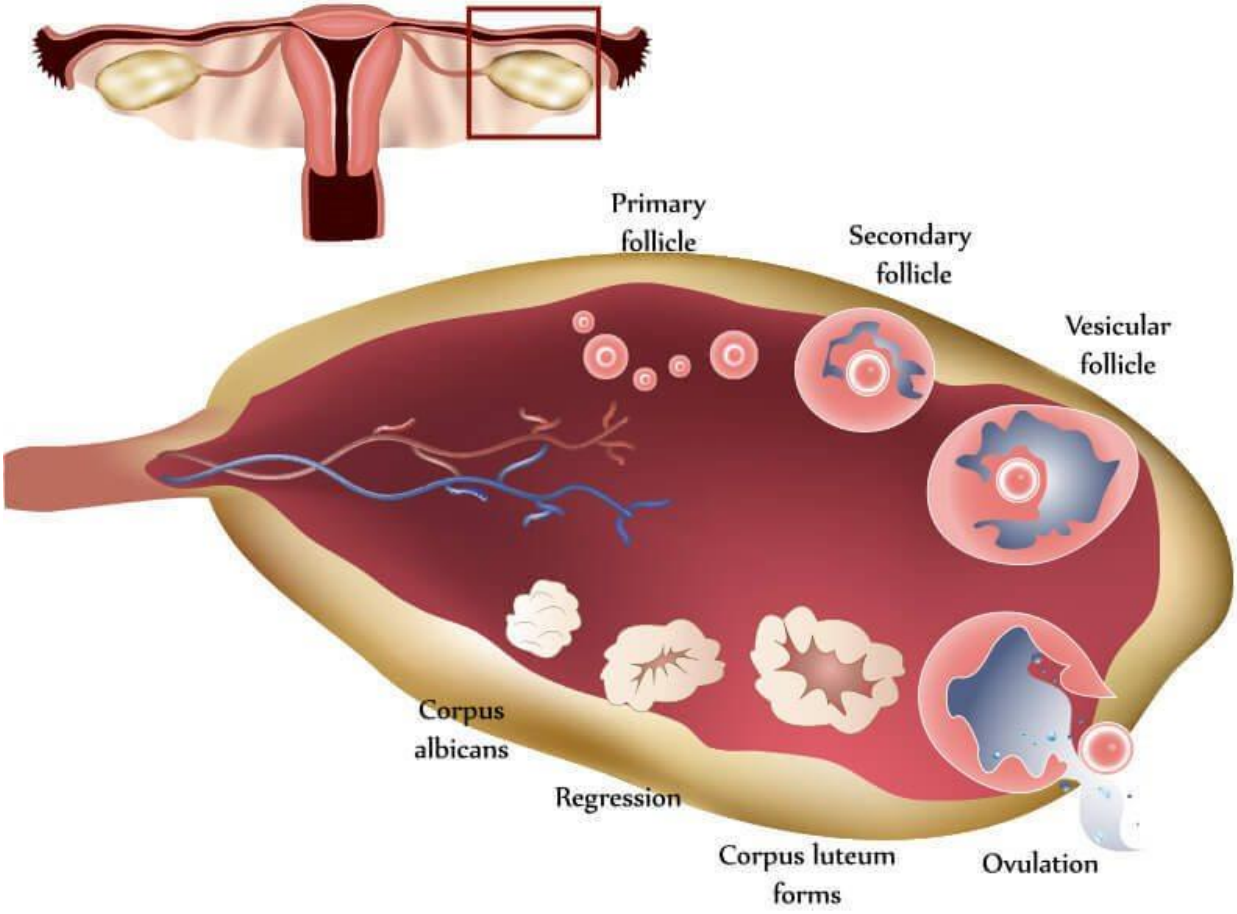

Figure 1.2. Normal Ovary and Ovulation. (Adapted from http://ovulation.guide/, 2017)

1.2. Ovarian Cysts

An ovarian cyst is the enlargement of either ovary beyond 5 cm in size, which is considered abnormal. Many different types of ovarian cysts exist, each classified as benign or malignant. Ovarian cysts are fluid-filled sacs or pockets in an ovary or on its surface. The most common benign ovarian cysts in a premenopausal female are functional cysts, which are typically simple, clear, and non-septated. The most common malignant ovarian cysts are epithelial carcinomas. The presence of an ovarian cyst can be detected on bimanual examination, and the diagnosis can be confirmed by ultrasound evaluation. Many women have ovarian cysts at some time. Most ovarian cysts present little or no discomfort and are harmless. The majority disappears without treatment within a few months. However, ovarian cysts that are ruptured can cause serious symptoms. A cyst becomes a problem when it doesn't go away or gets bigger. It can become painful. There's also the possibility of cancer, but it is rare. The chances go up as an individual gets older. (Miranda, et.al. 2013)

Ovarian cysts may be classified into 2 categories- Functional and Nonfunctional.

Functional Cyst: The most common type of ovarian cyst is called a functional cyst. These cysts are described as "functional" because they often develop during the menstrual cycle. There are 3 types:

Follicular cysts: These usually go away on their own in 1 to 3 months. These form when an egg does not get release as expected, so the follicle keeps growing.

Corpus luteum cysts: These also usually go away on their own. These form after the follicle ruptures and releases the egg (ovulation). The follicle reseals and fluid starts to build up within it. They can enlarge and cause pain, bleed, or twist the ovary. Fertility medicines used to promote ovulation (such as clomiphene) can increase the chances of developing these type of cysts.

Theca lutein cysts: This kind of cysts occur within the thecal layer of cells surrounding developing oocytes. Under the influence of excessive human chorionic gonadotropin (hCG), thecal cells may proliferate and become cystic. This is usually on both ovaries.

Non-functional cysts: They include the following:

Chocolate Cyst: Cysts caused by endometriosis which means endometrial tissue being located outside the uterus.

Hemorrhagic ovarian cyst: When internal hemorrhage occurs into functional cysts of the ovary it is called a hemorrhagic ovarian cyst.

Dermoid cyst: Formed with non-ovarian tissue

Ovarian serous cystadenoma: The most common ovarian neoplasm, representing 20% of ovarian neoplasms, and is benign.

Ovarian mucinous cystadenoma: Benign cystic tumor lined by a mucinous epithelium

Para ovarian cyst: These are epithelium-lined fluid-filled cysts in the adnexa adjacent to the fallopian tube and ovary.

Cystic adenofibroma: These rare benign ovarian tumor that contains both epithelial and fibrous stromal components.

Borderline tumoral cysts: Benign mucinous tumors are multi-loculated cysts that are filled with opaque, thick, mucoid material.

Polycystic ovary syndrome: An ovary with many cysts, which may be found in normal women.

(William, 2013)

1.3. Polycystic Ovary

The ovaries are enlarged, with a thick, scarred capsule associated with an abnormally high number of follicles in the ovaries. This gives the impression of multiple cysts and hence the term ‘polycystic’. Any ovarian follicle that is larger than two centimeters, is called an ovarian cyst. Cyst is a closed hollow sac that usually contain air, fluids, or semi-solid material. The follicles in polycystic ovaries may concurrently exist in varying states of growth, maturation, or degeneration.

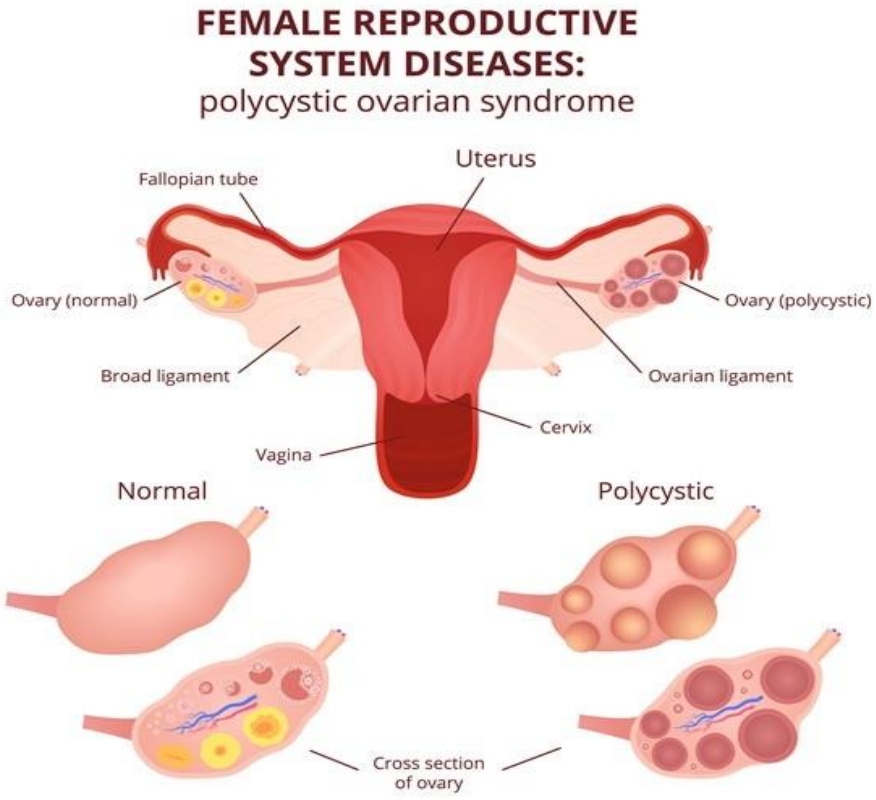

Figure 1.3. Difference between Normal and Polycystic Ovaries. (Smith, 2016)

1.4. Pathophysiology

Polycystic ovary syndrome is a disease for which the exact mechanism of pathogenesis is unknown, however, several possible mechanisms have been proposed. Insulin resistance is a common feature of PCOS and is implicated in causal relationships with major metabolic and reproductive morbidities. (Setji & Brown, 2007) Insulin resistance can lead to increased production of insulin and resulting hyperinsulinemia may lead to increased androgen production in the adrenal glands and ovaries. (ACOG Practice Bulletin, 2002) However, androgens themselves might be implicated in producing or enhancing insulin resistance in women by impairing glucose utilization in muscle and adipose tissue. (Setji & Brown, 2007) The endocrinologic abnormality of PCOS begins soon after menarche. Chronically elevated luteinizing hormone (LH) and insulin resistance are 2 of the most common endocrine aberrations seen in PCOS. The genetic cause of high LH is not known. It is interesting to note that neither an elevation in LH nor insulin resistance alone is enough to explain the pathogenesis of PCOS. (Balen, 2005) In vitro and in vivo evidence offer support that high LH and hyperinsulinemia work synergistically, causing ovarian growth, androgen production, and ovarian cyst formation.

Obesity, which is seen in 50% to 65% of PCOS patients, may increase the insulin resistance and hyperinsulinemia. One important caveat is that the correlation between hyperandrogenism and insulin resistance has been recognized in both obese and non-obese anovulatory women. It is important to realize that a non-obese patient may also have insulin resistance. However, the insulin levels in obese women are higher than their non-obese counterparts. Clinically, though, both groups will have evidence of hyperandrogenism and oligo-ovulation or anovulation. Insulin resistance can be characterized as impaired action of insulin in the uptake and metabolism of glucose. Impaired insulin action leads to elevated insulin levels, which causes a decrease in the synthesis of two important binding proteins: insulin-like growth factor binding protein (IGFBP-I) and sex hormone binding globulin (SHBG). IGFBP-I binds to IGFBP-II and SHBG binds to sex steroids, especially androgens. The triad of hyperandrogenism, insulin resistance, and acanthosis nigricans (HAIR-AN) syndrome appears in a subgroup of patients with PCOS.

Acanthosis nigricans, a dark and hyperpigmented hyperplasia of the skin typically found at the nape of the neck and axilla, is a marker for insulin resistance. Acanthosis nigricans is usually found in about 30% of hyperandrogenic women. (Pannill, 2002)

The fundamental defect of PCOS remains unknown. The endocrinologic effect of PCOS produce a viscous cycle of events as shown in the flow chart.

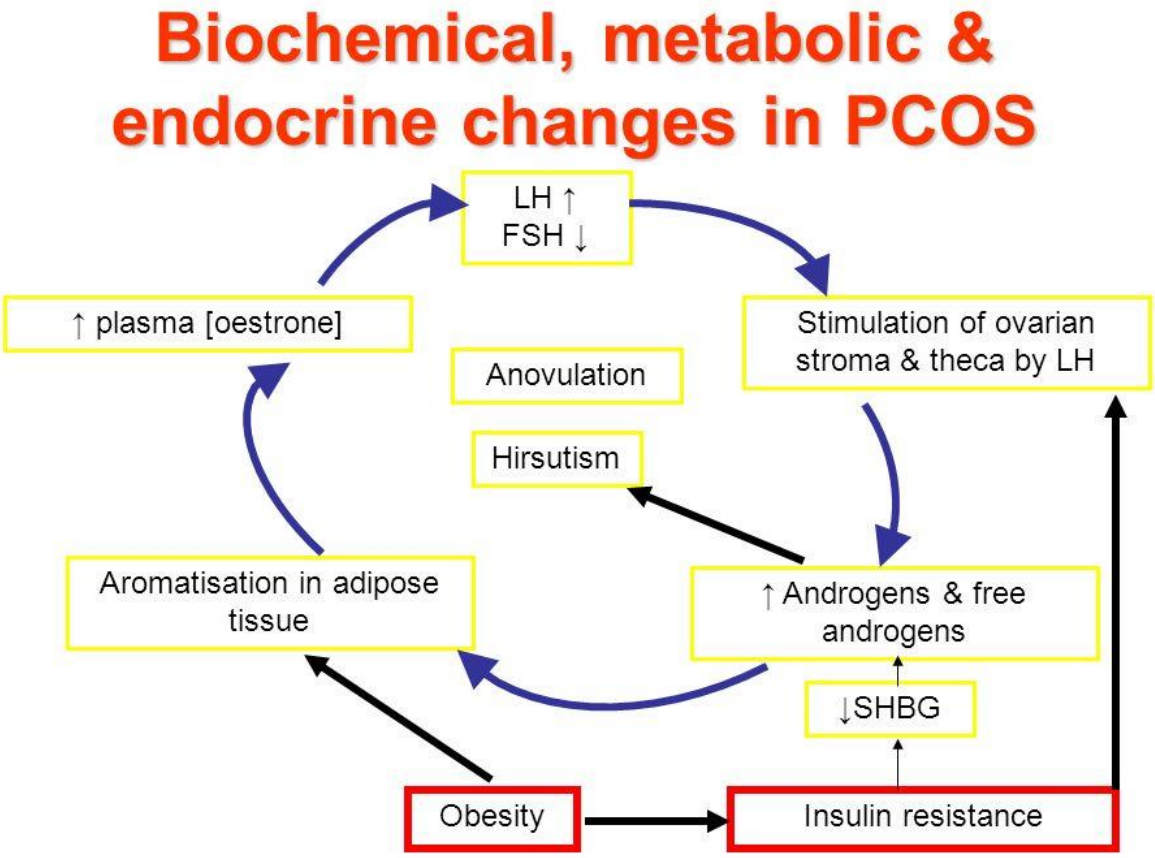

Figure 1.4. Pathophysiology of PCOS. (Perkins et al., 2014)

1.5. Signs and symptoms

The major features of PCOS include the following:

Oligo or Anovulation

When eggs or ova are not released by the ovaries, or are not released every month.

Hirsutism

Hirsutism refers to the growth of course, dark hair in areas where women typically grow fine hair or no hair at all: above the lip and on the chin, chest, abdomen, and back. This excess hair growth is caused by an increased level of androgens. Androgen is secreted by the ovaries or adrenal glands and produced locally in the hair follicle. Approximately 70-80% of PCOS patient have hirsutism.. (Barbieri, 2010)

Androgenetic Alopecia

If hair follicles are sensitive to androgens they can also decrease the growth of hair on scalp causing hair thinning and male pattern alopecia Androgenetic alopecia is a common form of hair loss in both men and women. In men, this condition is also known as male-pattern baldness. Hair is lost in a well-defined pattern, beginning above both temples. Over time, the hairline recedes to form a characteristic "M" shape. This particular occurrence is quite common in PCOS patients. (U.S National Library of Medicine, 2017)

Infertility

The first detection of PCOS is usually made when couples try to get pregnant but cannot conceive or multiple miscarriage during the first trimester. The most common cause of infertility around the world is PCOS. When women are affected by PCOS they may not ovulate every month and there may be several months during which there is no ovulation. (Hasanzadeh, 2014)

Obesity and metabolic syndrome

The link between PCOS and obesity is complicated. Being Overweight Cause PCOS and PCOS result in obesity, it's a two way street. Women with PCOS produce too much insulin, or the insulin they produce does not work as it should. The inability of insulin to function normally is one reason why women with PCOS tend to gain weight or have a

hard time losing weight. On the other hand woman with PCOS have a greater risk for obesity. (Kyle & Hignett, 2011)

Diabetes

A common characteristic of PCOS is insulin resistance. When insulin resistance occurs, the pancreas needs to make more and more insulin to effectively control blood glucose levels causing hyperinsulinemia. Insulin resistance is a risk factor for type 2 diabetes, gestational diabetes (diabetes during pregnancy) and pre-diabetes. (Diabetes State/Territory Organizations Australia, 2012)

Obstructive Sleep Apnea

PCOS has been strongly linked to sleep apnea. Sleep apnea is a sleep disorder characterized by brief episodes of stopped breathing during sleep. This disrupts sleep and impacts oxygen delivery to the body. Sleep apnea can lead to lower pain tolerance, high blood pressure, mood changes, heart disease, and increased weight. Signs of sleep apnea may also include excessive sleepiness during waking hour, attention problems, chronic snoring, and episodes of ceased breathing while asleep.

(Tasali et al., 2008)

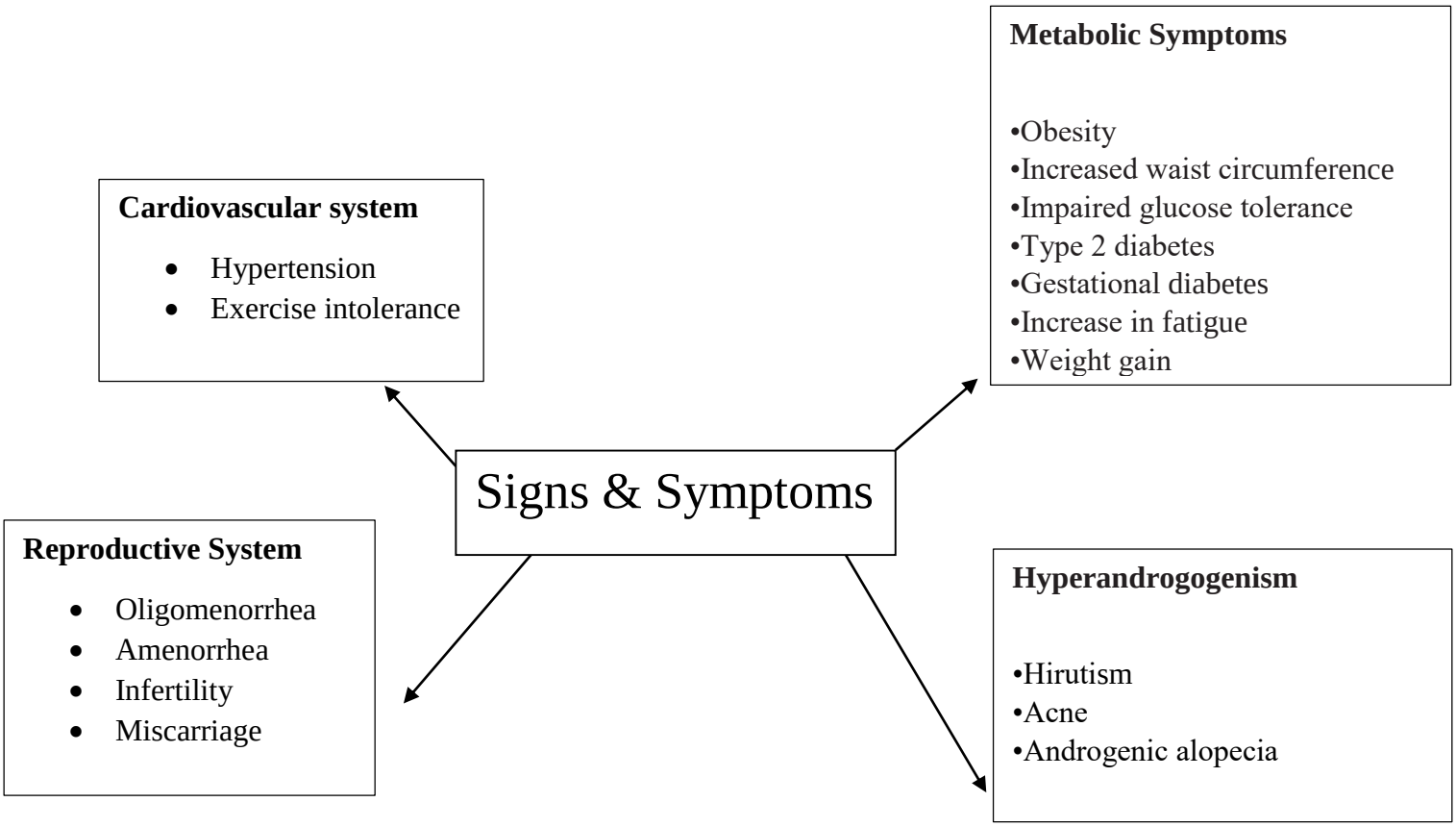

Figure 1.5. Signs and Symptoms of PCOS

1.6. Diagnosis of PCOS

There are different diagnostic guidelines for Polycystic Ovarian Syndrome but all of them rely on the combination of the three major elements to make diagnosis

- Ovulatory Dysfunction
- Hyperandrogenism
- Ovarian Morphology

There are several things to consider during diagnosis

- Polycystic ovarian morphology requires transvaginal ultrasonography which must demonstrate 12 or more follicles measuring 2-9 mm in diameter in each ovary. The ovarian volume will be increased (more than 10 ml)

- Testosterone measurements are often inaccurate in the normal female and polycystic ovary syndrome range, and the definition of "hyperandrogenemia" is often vague.

- While ovulatory dysfunction typically results in oligo-amenorrhea, many women with irregular ovulation have regular menses. Thus, a history of regular menses does not rule out polycystic ovary syndrome.
- New diagnostic tools may be on the horizon. Anti-mullerian hormone (made by antral follicles, which are numerous in polycystic ovaries) in combination with luteinizing hormone levels has high sensitivity and specificity for the diagnosis of polycystic ovary syndrome. (Setji et al., 2007)

There are different lab tests which can be done on patients who are being suspected to have PCOS. Baseline screening laboratory studies for women suspected of having PCOS may include the following:

- Thyroid function tests (eg, TSH, free thyroxine)
- Serum prolactin level
- Total and free testosterone levels
- Free androgen index
- Serum hCG level
- Cosyntropin stimulation test
- Serum 17-hydroxyprogesterone (17-OHPG) level
- Urinary free cortisol (UFC) and creatinine levels
- Low-dose dexamethasone suppression test
- Serum insulin-like growth factor (IGF)–1 level

Other tests used in the evaluation of PCOS include the following:

- Androstenedione level
- FSH and LH levels
- GnRH stimulation testing
- Glucose level
- Insulin level
- Lipid panel

Imaging tests are also used in the evaluation of PCOS:

- Ovarian ultrasonography, preferably using transvaginal approach
- Pelvic CT scan or MRI to visualize the adrenals and ovaries

Biopsy

An ovarian biopsy may be performed for histologic confirmation of PCOS; however, ultra-sonographic diagnosis of PCOS has generally superseded histopathologic diagnosis. An endometrial biopsy may be obtained to evaluate for endometrial disease, such as malignancy.

(UK: Royal College of Obstetricians and Gynecologists, 2007)

1.7. Risk Factors of PCOS

Obesity

Obesity is a common finding in woman with PCOS and between 40-80% woman with this condition are reported to be overweight or obese. Environmental factors such as sedentary lifestyle, lack of exercise, high intake of fatty food contribute to the prevalence of obesity in women with PCOS. (Sam, 2007)

Heredity

Polycystic ovary syndrome (PCOS) is an oligo genic condition, with a heritability of ∼70%. To determine the rate of clinically evident polycystic ovary syndrome (PCOS) among first-degree female relatives within families with a clinical and biochemical evaluation of the mothers and sisters of 93 patients with PCOS were done. The rates of PCOS in mothers and sisters of patients with PCOS were 24% and 32%, respectively, although the risk was higher when considering untreated premenopausal women only. (Kahsar-Miller et al., 2001)

Increased Insulin Resistance

Women with insulin resistance are at higher risk of having PCOS. Here insulin receptors are normal and do not have genetic mutation. But defect is at post receptor level e.g. activation of glucose transporter and transport of glucose into the cell. There may be glucose intolerance and type II diabetes. The patients may exhibit greater rates of gestational diabetes. (Begum & Akhter, 2000) Insulin is also a major regulator of many enzymes involved in lipoprotein metabolism. Resistance to insulin may contribute, in part, to the dyslipidemia observed in PCOS. (Kauffman et al. 2003)

Hyperandrogenemia

This was defined as increased circulating levels of androgen. The normal range of total testosterone for women is 15 - 70 (ng/dl). A total testosterone level > 70 ng/dl was regarded as indicating hyperandrogenemia. Women with hyperandrogenemia are most likely to have PCOS. (Hussein and Alalaf, 2013)

Adipokines

Adipokines or adipocytokines are chemokines or chemical signaling proteins secreted by adipose tissue. The increased incidence and severity of cardiovascular risk factors and of metabolic disturbances in PCOS may be in part related to the abnormal production and release of adipokines and inflammatory factors by adipose tissue. Although traditionally regarded as a storage organ, emerging evidence also strongly suggests that adipose tissue is an endocrine organ, whose altered function may produce widespread cardio metabolic disturbances in PCOS. It is believed that dysregulated adipocyte function and obesity play a pathophysiological role in PCOS. (Mistry, 2008)

Leptin

Leptin, a protein secreted by adipocytes, suppresses an individual's appetite and promotes energy expenditure. Serum leptin levels are elevated in obese patients, who are considered leptin resistant. Hyperleptinemia seems to be a positive risk factor for cardiovascular disease. Some studies have found leptin levels to be elevated in PCOS women compared to controls. (Juha et al., 1997) The general consensus reported by the majority of published studies is that there is no difference in circulating leptin levels in PCOS subjects in comparison to BMI-matched controls.

1.8. Long Term Complications

Subfertility

Subfertility generally describes any form of reduced fertility with prolonged time of unwanted non-conception. This is largely a consequence of oligoanovulation, but may also result from abnormalities in oocyte development due to hormonal or other abnormalities.

Miscarriage

There is an increased risk of miscarriage in PCOS patients who do conceive; however, this risk is confounded by the high rate of obesity in this population, which is also a risk factor for miscarriage. The symptoms of PCOS including irregular or no periods, along with a documented increase in the risk of miscarriage, mean the chance of getting pregnant naturally is low if the individual has PCOS. There are cases where patients with PCOS have had miscarriage in the early trimester.

Cardiovascular disease

Patients with PCOS often exhibit dyslipidemia, which is likely related both to hyperinsulinemia and hyperandrogenism. Women with PCOS are at twice as much risk of heart disease or stroke. There are a number of factors that increase the risk of cardiovascular disease such as:

- high blood fats or cholesterol
- high levels of 'bad' cholesterol or low density lipoprotein cholesterol which increases the risk of developing heart disease
- high levels of inflammatory proteins which can alter the function of blood vessels and increase insulin resistance
- high blood pressure

Type 2 Diabetes

Women with PCOS have between four and seven times increased risk of developing prediabetes and type 2 diabetes than women without PCOS. Prediabetes is the stage before type 2 diabetes. Women with PCOS are also more likely to develop diabetes earlier. The risk is conferred by their level of insulin resistance and as many as 10% may develop Type 2 diabetes mellitus by their fourth decade.

Endometrial Cancer

A combination of hyperinsulinemia, hyperandrogenism, and oligoanovulation increases the risk of endometrial cancer and other endometrial disorders. Having the condition PCOS does not cause endometrial cancer, rather it is having very infrequent periods which may

increase the risk of endometrial cancer. Chronic anovulation (lack of eggs being released regularly) leads to a lack of menstruation or shedding of the lining of the uterus (endometrium). If this happens, the endometrium can thicken which can increase the risk of abnormal cells that, as a woman ages, can develop into cancerous cells. This risk can be greatly reduced with treatments such as the oral contraceptive pill. By improving the regularity of the menstrual cycle, the uterine lining is shed more often during menstruation. Adequate physical activity and having a healthy body weight can also assist in normalizing periods and reducing the risk of endometrial cancer.

Psychiatric disorders

Case studies have showed that women with PCOS have an increased risk of anxiety, depression, binge-eating disorder, and bipolar disorder. The depression is most likely to occur in the teenage because of the trouble of managing body weight. Adult women also suffer from frustration because of the sub fertility and miscarriage in their reproductive age. A patient with PCOS also suffers from low self-confidence because of daily struggle with hirsutism. The psychiatric disorders are most likely to happen due to the insufficient sound sleep which is a symptom of PCOS.

(Goodarzi et.al, 2011)

1.9. Prevention

Lifestyle Modification

It was realized early on that weight control improves many aspects of PCOS. The cycles become more regular, androgen levels are reduced, lipid and glucose metabolism improves, and spontaneous pregnancy may follow. It was also realized that obese patients do not have to reach the normal body mass index; a weight reduction of even a few percent has clinical benefits. This is because visceral fat is metabolically more active, and weight loss of a few percent is associated with significant loss of visceral fat. On the basis of these observations, weight management by dieting and exercise is now recommended to all overweight/obese women with PCOS.

Balanced Diet

Women with PCOS are often found to have higher than normal insulin levels. If enough insulin is not produced, blood sugar level can rise. This can also happen because of insulin resistance, meaning the body cannot use the produced insulin effectively. If a person is insulin resistant, her body may try to pump out high levels of insulin in an effort to keep her blood sugar levels normal. Too-high levels of insulin can cause her ovaries to produce more androgens, such as testosterone. Insulin resistance may also be caused by having a body mass index above the normal range. Insulin resistance can make it harder to lose weight, which is why women with PCOS often struggle with this issue.

A diet high in refined carbohydrates, such as starchy and sugary foods, can facilitate insulin resistance, and therefore weight becomes more difficult to control. High-fiber foods can help combat insulin resistance by slowing down digestion and reducing the impact of sugar on the blood. This may be beneficial to women with PCOS. Great options for high-fiber foods include:

- cruciferous vegetables, such as broccoli, cauliflower, and Brussels sprouts
- greens, including red leaf lettuce
- green and red peppers
- beans and lentils
- almonds
- berries

- sweet potatoes
- pumpkin

Lean protein sources like chicken and fish do not provide fiber but are very filling and a healthy dietary option for women with PCOS.

Foods that help reduce inflammation may also be beneficial. They include:

- tomatoes
- spinach
- almonds and walnuts
- olive oil
- fruits, such as blueberries and strawberries
- fatty fish high in omega-3 fatty acids, such as salmon

Refined carbohydrates cause inflammation, exacerbate insulin resistance, and should be avoided. These include highly processed foods, such as:

- white bread
- muffins
- breakfast pastries
- sugary desserts
- white potatoes

(Healthline, 2016)

Exercise

Studies have shown that intensive exercise with a goal of ≥ 150 min/week of activity resulting in weight loss reduced the risk of type 2 diabetes in PCOS patients. (Knowler et al., 2002)

However there are several ways in which exercise can help prevent and aide the symptoms of PCOS. There are number of ways exercise can help managing PCOS. The benefits of exercise are enlisted below:

- Exercise, especially strength training, increases insulin sensitivity in both healthy women and women who have polycystic ovarian syndrome.
- A combination of cardiovascular aerobic exercise and resistance training is extremely beneficial for improving insulin sensitivity.
- Exercise helps protect against the development of lifestyle diseases such as cardiovascular disease and diabetes in people with PCOS.
- Combining high intensity resistance exercise with endurance training will improve the body's metabolic responses and enhance muscle strength. A greater proportion of lean body mass will also assist in managing the body's response to glucose in the prevention of diabetes. (Cuff et al., 2003).
- Skin specialist suggest patient with PCOS to do regular exercise to manage their hirsutism and acne prone skin. (Volk, 2016)

Exercise also has powerful effects on a women's reproductive function. Vigorito et al., (2007) found that women diagnosed with PCOS who were not ovulating, were able to restore their normal menstrual cycle following a 3-month aerobic training program. Improvements in hormone markers as a result of exercise meant that successful pregnancy rates and ovulation increased.

Anxiety and depression are common psychological symptoms, in up to 40% of women who are diagnosed with PCOS. Given the known link between obesity and depression, a reduction in weight is extremely beneficial in order to manage emotional disturbances associated with PCOS (Farrell & Antoni, 2010).

Symptoms of PCOS such as acne and infertility are often what triggers a negative emotional response. The ability for exercise to improve or even eliminate these symptoms, may also result in positive improvements in mood and an individual's emotional state.

1.10. Treatment

Healthy lifestyle

Overweight individuals may consider weight loss as the treatment. A small amount of weight loss is likely to help balance hormones and start up menstrual cycle and ovulation. Eating a balanced diet that includes lots of fruits, vegetables, whole grains, and low-fat dairy products might help with the hormonal imbalance. For obese women, getting regular exercise will help them control or lose weight and feel better. For women who smoke, quitting cigarette is the best option. Women who smoke have higher levels of androgens than women who do not smoke. (Barbieri, 2010)

Hormone therapy:

Hormone therapy can help people who are suffering from PCOS symptoms but not planning for conceiving right away. To correct menstrual cycle problems, birth control hormones keep endometrial lining from building up for too long. This can prevent uterine cancer and keep the menstrual cycle normal. Androgen lowering medications and birth control hormone pills combination work as hormone therapy for acne, excess facial and body hair and hair loss.

Regular Checkups

Regular checkups are important for catching any PCOS complications, such as high blood pressure, high cholesterol, uterine cancer, heart disease, and diabetes.

Medication

Medication should individualized patient goals. When choosing a treatment regimen, physicians must take into account comorbidities and the patient's desire for pregnancy. Lifestyle modifications should be used in addition to medical treatments for optimal results. Few agents have been approved by the U.S. Food and Drug Administration specifically for use in polycystic ovary syndrome, and several agents are contraindicated in pregnancy. Insulin-sensitizing agents are indicated for most women with polycystic ovary syndrome because they have positive effects on insulin resistance, menstrual irregularities,

anovulation, hirsutism, and obesity. Metformin has the most data supporting its effectiveness. Rosiglitazone and pioglitazone are also effective for ameliorating hirsutism and insulin resistance. Metformin and clomiphene, alone or in combination, are first-line agents for ovulation induction. Insulin-sensitizing agents, oral contraceptives, spironolactone, and topical eflornithine can be used in patients with hirsutism.

Table 1.1. Medications Used in Polycystic Ovarian Syndrome

Medication	**Description**	**Manifestation Treated**	**Main Adverse Effect**	**Typical Dosage**
Clomiphene	Ovulation induction agent	Infertility	Multiple pregnancy/ovarian hyperstimulation, thromboembolism, visual disturbances	50 to 100 mg per day
Eflornithine	Inhibits hair growth	Hirsutism	Mild skin irritation	13.9% cream applied to face twice per day
Metformin	Insulin-sensitizing agent	Hirsutism; infertility; insulin resistance;	GI upset, lactic acidosis, increase in homocysteine levels	1,500 to 2,250 mg per day
Oral contraceptives	—	Hirsutism; menstrual irregularities	Nausea, headache, spotting, thrombophlebitis, deep venous thrombosis	Varies
Pioglitazone	Insulin-sensitizing agent	Hirsutism; infertility; insulin resistance	Congestive Heart failure, may cause weight gain	30 mg per day
Rosiglitazone	Insulin-sensitizing agent	Hirsutism; infertility; insulin resistance; menstrual irregularities	CHF, hepatotoxicity, edema, increase in homocysteine levels	2 to 8 mg per day

Medication	Description	Manifestation Treated	Main Adverse Effect	Typical Dosage
Spironolactone	Anti-androgenic, anti-mineralocorticoid	Hirsutism; menstrual irregularities	Hyperkalemia, nausea, breast tenderness	50 mg per day to 100 to 200 mg per day
Acarbose	Insulin-sensitizing agent	Hirsutism; menstrual irregularities	GI upset	150 mg per day(for menses regulation)
Desogestrel /ethinyl estradiol	Oral contraceptive	Hirsutism	increased total cholesterol and low-density lipoprotein cholesterol; thromboembolism, stroke, MI	0.15 mg desogestrel plus 30 mcg ethinyl estradiol per day
Finasteride	5-alpha-reductase inhibitor	Hirsutism	Hypersensitivity reaction, decreased libido	5 mg per day
Flutamide	Nonsteroidal antiandrogen used mostly in prostate cancer	Hirsutism	Thrombocytopenia, leukopenia, liver toxicity, hot flashes	250 mg once or twice per day
Letrozole	Nonsteroidal competitive inhibitor of aromatase; inhibits conversion of adrenal androgens	Infertility	Osteoporosis, thromboembolism, MI, hot flashes, arthralgia	2.5 mg per day
Sibutramine	Centrally acting appetite suppressant	Hirsutism	Tachycardia, hypertension, headache, dry mouth	10 mg per day

(Pillai et al., 2007)

1.12.1. Prevalence of PCOS:

Estimates of the prevalence of PCOS have been affected by the population studied and the diagnostic criteria used. Using the National Institutes of Health definition, the prevalence is 4.5% to 11.2% in Alabama, 9% in Greece, and 6.5% in Spain. The prevalence of polycystic ovaries associated with metabolic abnormalities among Indian immigrants in Britain is particularly high.

Table 1.2. Prevalence of PCOS Worldwide

Country/Region	Extrapolated Prevalence	Population estimated Used
USA	7,341,385	293,655,405
Canada	812,696	32,507,874
United Kingdom	1,506,767	60,270,708
Spain	1,007,019	40,280,780
China	32,471,190	1,298,847
Afghanistan	712,841	28,513,677
India	26,626,765	1,065,070607
Bangladesh	3,53,511	141,30,476
Pakistan	3,79908	159,196,336
Sri Lanka	497,629	19,905,165
Saudi Arabia	644,898	25,795,938
South Africa	1,111,211	44,448,470
Australia	497,828	19,913,144
New Zealand	99,845	3,993,817

(Balen et al., 2005)

1.12.2. PCOS in Bangladesh

An observational study was carried out in Gynaecology Outpatient Department (GOPD) of Combined Military Hospitals of Jessore, Rangpur and Ghatail during November 2008 to June 2013. One hundred patients participated the study. Most of the patients (92%) were 20–30 years old. Chief complaints of the participants are illustrated below in the table:

Table 1.3. Prevalence of characteristics of PCOS

Complains	Percentage
Primary Infertility	72%
Secondary Infertility	28%
Menstrua Irregularity	80%
Hirsutism	30%
Overweight	71%
Obesity	17%
Polycystic Ovaries	20%
Normal Ovaries	80%
LH/FSH ratio: 2.1-2.9	30%
LH/FSH ratio: >3	32%
LH/FSH ratio: normal	38%

70 women aging 23-30 in BIRDEM, Endocrine OPD (Out Patient Department) unit were studies for clinical and biochemical characteristics of PCOS in Bangladesh. The study was conducted from November 2010 to May 2011. The observation of the characteristics found are showed in the following chart:

Table 1.4. Prevalence of Biochemical Characteristics of BIRDEM Study

Biochemical Characteristic	Percentage
Glucose intolerance	47.1%
Dyslipidemia	45.7%
Hypertension	24.3%
Hirsutism	88.6%
Acanthosis nigricans	50%
Polycystic ovaries by ultrasound	87%
Hyperprolactinemia	18.6%
Hypothyroidism	11.4%
Metabolic Syndrome	15.3%

PCOS with hyperprolactinemia with MS 8.6%, PCOS with hypothyroidism with metabolic syndrome 5.6%, PCOS with hypothyroidism with hyperprolactinemia 4.3% and rest 4.3% had all the 4 in combination.

Another study was conducted in Bangabandhu Sheikh Mujib Medical University, Dhaka, from January 2008 to March 2009, on 50 women with PCOS which was diagnosed by three criteria: (1) oligo and/or anovulation, (2) hyperandrogenism and (3) polycystic ovaries, to evaluate their characteristics and laboratory investigation findings. The subjects were 21-25 years old. The investigation result is shown in the chart below:

Table 1.5. Investigation Results of BIRDEM Study

Characteristic	**Percentage**
Menstrual cycle irregularity	80%
Oligomenorrhoea	28%
Dysmenorrhoea	18%
Nulliparity	90%
History of abortion	10%
Acne	52%
Hirsutism	50%
Anteverted uterus	100%
Free fornices	98%
Healthy cervix	94%

Laboratory results are shown in the chart below:

Table 1.6. Laboratory Results of BIRDEM Study

Findings	**Percentage**
Low serum FSH	2%
Raised serum LH	56%
Raised Blood Sugar	30%
Serum prolactin	14%
Serum TSH	2%
PCOS evidence in Ultrasound	100%

(Anwary et al. 2010)

PCOS: Symptoms and Awareness in Urban Pakistani Women

The study performed on women in Karachi, Pakistan. It focused on the knowledge and the symptoms of PCOS among these women. Data was collected from 177 women amongst whom the majority were studying in university and a small portion consisted of educated house wives. 36.7%out of 177 subjects had hirsutism. (Facial hair: 19.5%, Breast hair: 6.5%, other forms of hirsutism: 6.5%). Regarding menstruation 14% had some sort of irregularity. 9% women had oligomenorrhoea, 3% women had amenorrhea. On the whole 10% were familiar with PCOS. This study did not show enough evidence to establish the prevalence of PCOS through ultrasonography rather hirsutism was the major sign of PCOS in the subject.

(Ansari et al., 2014)

A Study to Assess the Knowledge Regarding PCOS (Polycystic Ovarian Syndrome) among Nursing Students at NUINS (Nursing Usha Institute of Sciences)

This study was done on 150 student of Nitte Usha Institute of Nursing Sciences. They were given structured questionnaire and data was analysed wit descriptive and inferential statistics.85% of the subject were in the age group of 21-25years, 92% of them had regularmenstrual cycle,82% were consumingmixed diet 76% had average knowledge and 10.7%with good knowledge regarding polycystic ovarian syndrome. The study showed that consumption of junk food, dietary patterns of the students were influenced by their level of knowledge on PCOS.

(Sabitha & Sunanda, 2016)

Awareness about PCOS and the Likelihood of Its Symptoms in Adolescent Girls in a Semi-Urban Set-Up: A Cross Sectional Study

The objective of this study was to determine the prevalence and enhance the awareness of PCOS among the school going girls. This study was conducted in a government school in Sambalpur, Odisha state, India. The data was taken from 100 school going girls who were 14-17 years old. 12% of the subject were found to have hirsutism, 20% had extreme acne,

and 36% had menstrual irregularity. 78% of the student never heard of PCOS before. The prevalence of clinical PCOS in our study was 12%. A timely diagnosis of PCOS in symptomatic adolescent girls is important for the initiation of appropriate screening and treatment.

(Hansa et al. 2016)

Perception and Attitude of Patients regarding Polycystic Ovarian Syndrome (PCOS) in Tertiary Care Hospitals of Pakistan - A Survey Based Study

This quantitative study was performed in Pakistan to know about the perception of patients on polycystic ovarian syndrome (PCOS). This survey was conducted over a period of 8 months. The data was analyzed by SPSS and employed descriptive statistics.Total 270 patients were available for their clinical data.The survey revealed that 37% were in adult age group and 25.9% were also seen in middle age groups and 22.2% teenage groups whereas geriatrics were observed to be the least in number (14.8%). In terms of BMI, 51.8% patients were observed to be obese and 22.2% were extremely obese 55.6%of the patients did not know enough about the disease. The patients of polycystic ovarian syndrome were mostly young and the comprehension and awareness regarding the disease among the patients were generally found to be deficient. Equipping them with knowledge may lead to improved quality of life and a pharmacist can play a role in the said regard.

(Abbas et al., 2014)

Women's perceptions of polycystic ovary syndrome following participation in a clinical research study: implications for knowledge, feelings, and daily health practices.

This study assessed changes in knowledge, feelings, and daily health practices related to PCOS in clinical research study participants. 68 women who had received counselling and education about PCOS while participating in a clinical research study were invited to complete an online survey that assessed levels of concern, knowledge, healthy dieting, active living, and health care satisfaction before and after the study. 43 women completed the survey. After taking part in a clinical research study, participants believed they had increased knowledge and concern about the etiology and health consequences of PCOS,

better lifestyle practices and improved health care satisfaction. Enhanced knowledge of PCOS was positively associated with changes in healthy dietary habits and activity levels. After the study, women felt encouraged to participate in the management of their condition and communicate with their primary care providers.

(Colwell et al., 2010)

Women's experiences of polycystic ovary syndrome diagnosis

This was a cross- sectional study performed in Australia to explore the perceived experience of PCOS diagnosis, following by the development of a guideline for PCOS assessment and management. It involved questionnaires completed by 210 women with a previous medical diagnosis of PCOS, aged 18–45 years. 24% of women, PCOS diagnosis took more than 2 years and 39% saw three or more health professionals before diagnosis was made. 60% of the sample reported they were not given to information sources at time of diagnosis, 20% reported receiving information and 20% were giveninadequate information. Of those who reported provision of information at diagnosis, 62% felt dissatisfied withinformation provided about PCOS. 79% reported being provided with information about lifestyle management, 89% reported being provided with information about medical therapy, 83% about long-term complications and 95% about potential infertility.

(Gibson et al. 2014)

Awareness of PCOS (polycystic ovarian syndrome) in adolescent and young girls

Polycystic ovarian syndrome is a common endocrine disorder of women in their reproductive age. Awareness and accurate diagnosis is the first step in managing PCOS as it improves quality of life of the patient. This study was performed to assess the knowledge on PCOS among the medical students.Survey of 200 girls was done to assess the knowledge on the polycystic ovarian syndrome among the medical students of different colleges studying in 1st, 2nd, and 3rd year. The data was collected from the students by using structured questionnaire.In present study, 51% girls had normal BMI, 19.5% were

overweight, and 16.5% were obese while 13% were underweight. 33.5% females had acne, 16% had irregularity of menses, and 5% had hirsutism while 2% had infertility. In present study, 33% adolescent and young girls had information about PCOS from teacher, 19% got information from friend, 11.5% got information from a doctor, and 3.5% got information from newspaper while 5% got information from internet. 28% adolescent and young girls were unaware of PCOS.Thorough knowledge of the disorder and counseling for adolescents should be included in the curriculum which will provide awareness towards the disorder and lifestyle modification. Accurate diagnosis at a younger age may be a key.

(Jayshree & Chaitanya., 2017)

Survey of Poly Cystic Ovarian Disease (PCOD) Among the Girl Students of Bishop Heber College, Tiruchirappalli, Tamil Nadu, India

This study is an attempt to assess its prevalence in the girl students of Bishop Heber College in Tiruchirappalli City of Tamil Nadu. They undertook a survey among the female students of 18-31 age group. There were 252 subjects and the study was performed for five months from November 2015 to March 2016.

The study period was PCOS was diagnosed by using a questionnaire with Rotterdam's criteria and the prevalence was found to be 7.14%. This study definitely created awareness among the adolescent college girls about PCOS. The purpose of the study was to help the students modify their life style and to have better reproductive life later. The study also identified the adolescents with risk for developing PCOS. It enabled the researchers to guide the students with risk of developing PCOS about taking proper diagnosis and treatment with consultation of a gynecologist. In married girl students, especially in the presence of other risk factors for infertility, early conception is advised and to find the effectiveness of awareness program.

(Nivetha et al., 2016)

Aims & Objectives of the study

Polycystic Ovarian syndrome has become a common disorder in women recently. Unfortunately not many people are concerned about it. This ignorance is present not only in Bangladesh but also all around the world. So, the study aims to examine the level of awareness among the female population studying in undergraduate level aged in between 20-27 years old. The study has 5 major objectives:

1. To investigate knowledge among undergraduate students of different study background about signs & symptoms, risk factors, lifestyle modification, prevention and treatment of PCOS.
2. To evaluate their perception towards PCOS.
3. To assess potential risk factors among the subjects.
4. To determine the level of health concern and attitude to doctor consultation of the subjects
5. This study has highlighted the importance of early diagnosis of PCOS and reducing the associated ignorance to enable management and effective treatment.

Significance of the Study

Polycystic Ovarian syndrome is a common condition affecting 20% of the reproductive women. (Sirmans and Pate, 2014) The percentage is increasing day by day. At present even teenage girls are getting diagnosed with PCOS. This is an alarming situation as this condition has the signs and symptoms which are considered as normal hormonal imbalance. And in a developing country like Bangladesh many people have not even heard of PCOS. They are not concerned about the condition unless or until problems arise with conceiving.

At present many woman are facing infertility or having miscarriage. Many of this population are being diagnosed with PCOS. The major problem with PCOS is that it does not have any specific reason for occurring. Neither has it a complete cure. But, if diagnosed early, it can be managed with healthy and balanced diet and regular exercise. The consultation with doctor could be helpful if medications are needed in individual case. There are cases where patients with PCOS have had successful and healthy pregnancy with proper management of the condition.

In our country still most of the people are uneducated. The subject of the study was undergraduate students who are expected to be health concerned a lot more comparing to the mass people. But unfortunately there were subjects who are not even familiar with the term PCOS. The goal of the study was to make them familiar with the term as well as to make them aware of the consequences of the condition.

The study will determine how many of the undergraduate students has developed the risk of having PCOS. The survey questionnaire chalked out the health terms and factors they should be conscious about regardless having the risk of PCOS or not. The survey questionnaire was designed in such that will enable them to assess the signs and symptoms of the condition. So, they can seek help from the doctors at the earliest stage. Early diagnosis will help them manage this condition from the very beginning. The study will warn the population under the risk of developing PCOS to maintain a healthy lifestyle so that development of PCOS in later life can be prevented. That will eventually increase the rate of successful pregnancy of PCOS patients.

The study also focuses on the importance of having a balanced diet. Not many people of our country are concerned about the impact of regular exercise. The percentage of female regarding this are even lower. PCOS management is directly related with healthy lifestyle.

3.1 Type of the Study

It was a self-administered survey based study.

3.2 Study Population

The study was carried out on 350 students of Private and Public University studying in different departments.

3.3. Study Area

Dhaka University was the only public university for our study. Private universities included East West University, North South University, Ahsanullah University of Science and Technology.

3.4 Inclusion Criteria

University students studying in any department

3.5. Exclusion Criteria

Medical Students, female aged more than 27 years old or less than 20 years old, male students excluded from the survey.

3.6. Study Tools

A 3 pages structured questionnaire was prepared and it was in English language. The questionnaire has different parts consisting personal details, familiarity and perception about PCOS, signs & symptoms of PCOS, risk factor and complications of PCOS, feeling & lifestyle of PCOS patients, diagnosis & treatments of PCOS and preventive measures of PCOS.

3.7. Development of the Questionnaire

The questionnaire was developed based on different factors that shows the potentiality of developing PCOS among the university students. Perception about PCOS along with signs & symptoms, treatment, risk factors, diagnosis, perception towards doctor consultation, feelings towards lifestyle modification, exercise and food habit etc. were asked in the survey.

The questionnaire was prepared to learn the level of knowledge and awareness about PCOS along with demographic information that would help us to correlate among demographic characteristics with perception and attitude of people towards PCOS.

3.8. Data Collection Method

The data was collected through questionnaire that is formed in English language. The questionnaire consists of multiple choice type questions. The data was collected by both face to face interview and by questionnaire supply.

3.9. Sampling Technique

In these study equal samples from different department was followed. The departments' were-English, EEE, CSE, Law, BBA, Pharmacy, Statistics, Economics, Genetics and others.

3.10 Data collecting period

The duration of the study was about four months that started from August, 2017 up to October,

2017.

3.11. Data Analysis

After collecting, all the data were checked and analyzed with the help of Microsoft Excel 2013.

3.12. Ethics

Oral consent was taken from all participants before the survey took place. It was maintained strictly that there was no enforcement during data collection.

4.1. Distribution of Age Group in Study Population:

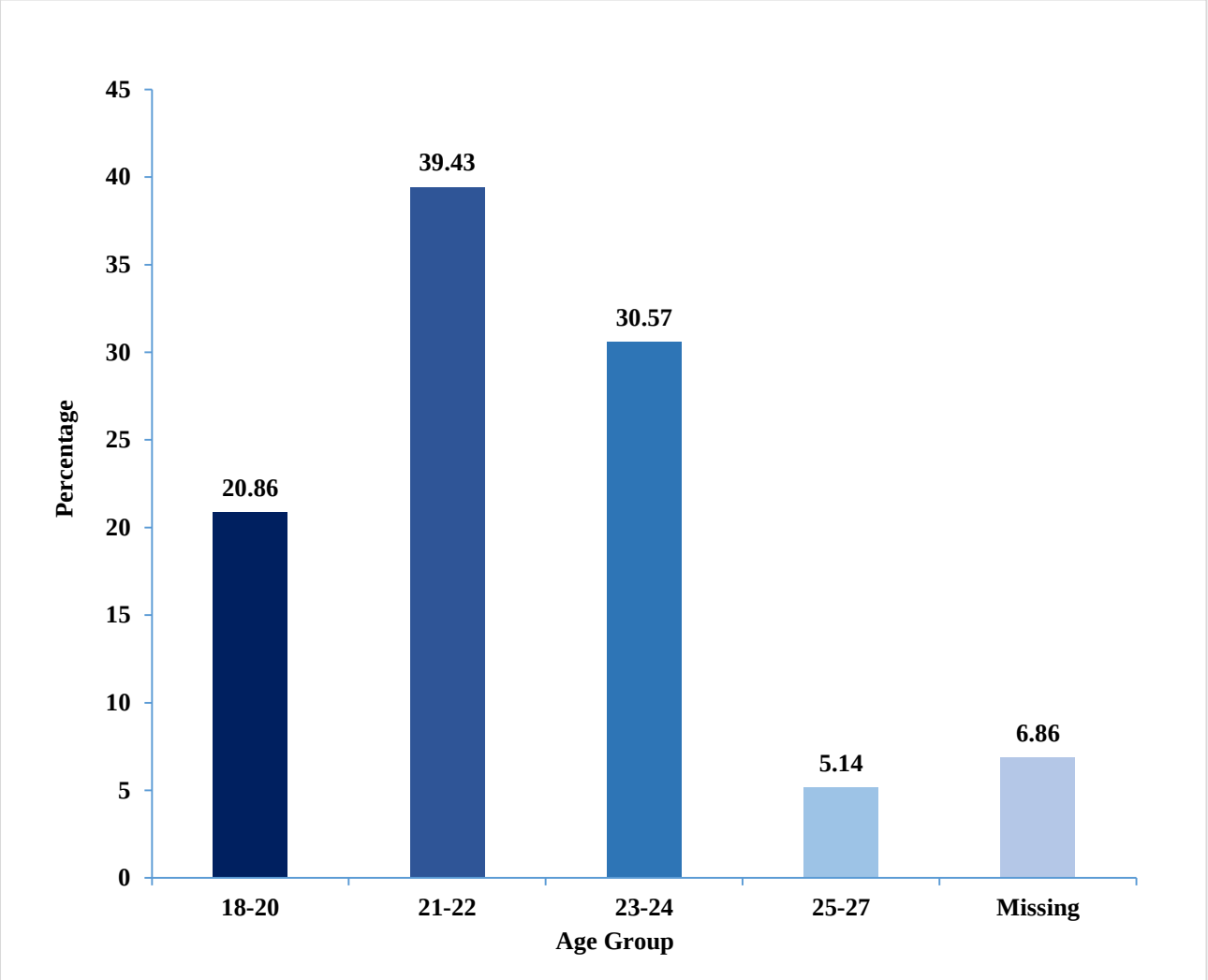

Figure 1.6. Distribution of Age Group in Study Population

The study showed that among 350 women 39.43% population belonged to 21-22 age group, 20.86% population belonged to 18-20 age group and 30.57% population belonged to 23-24 age group. Only 5.14% population were from 25-27 age group and some of the participants (6.86%) did not want to mention their age.

4.2. Distribution of Religion in Study Population

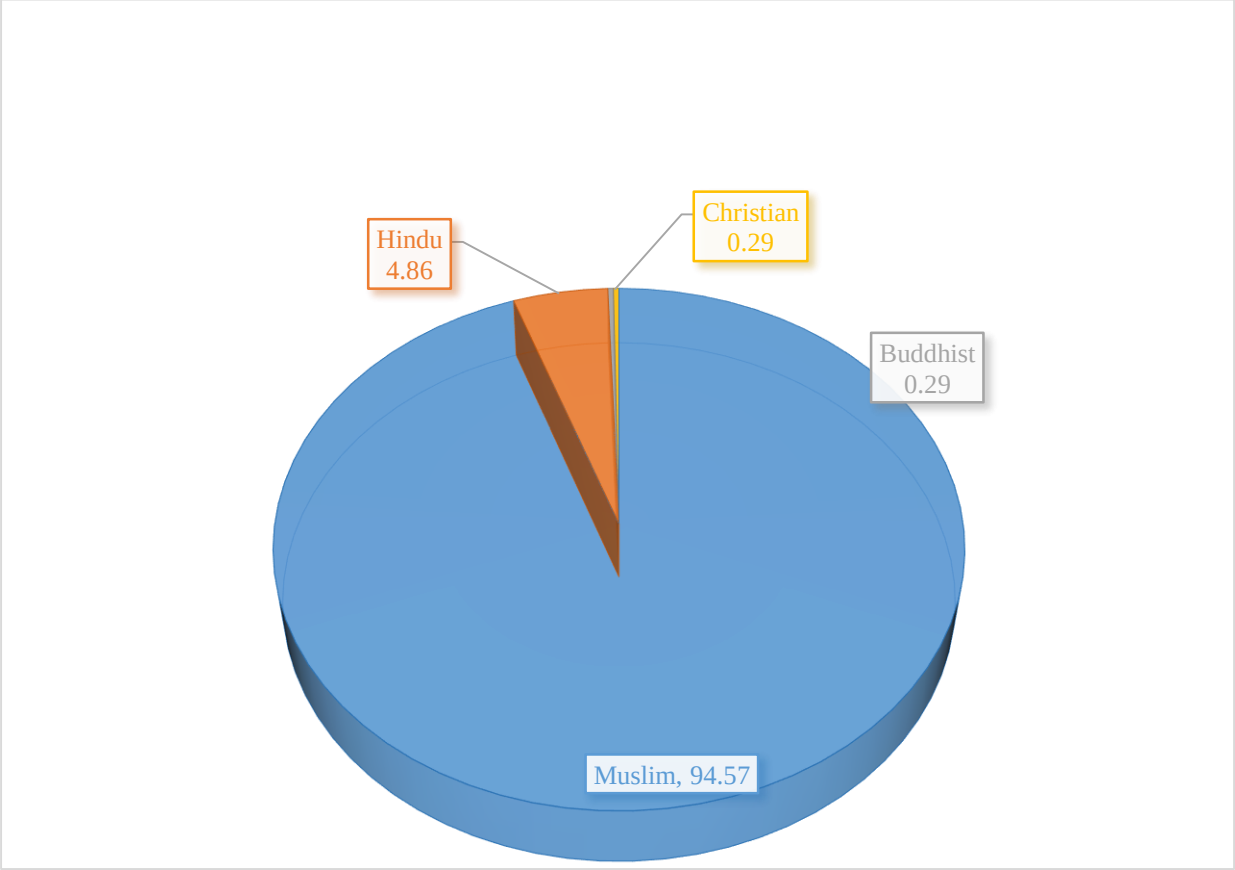

Figure 1.7. Distribution of Religion in Study Population

The majority of the participants were Muslim (94.57%). Hindu, Buddhist and Christian participant percentage was respectively 4.86%, 0.29% and 0.29%.

4.3. Distribution of Institution in Study Population

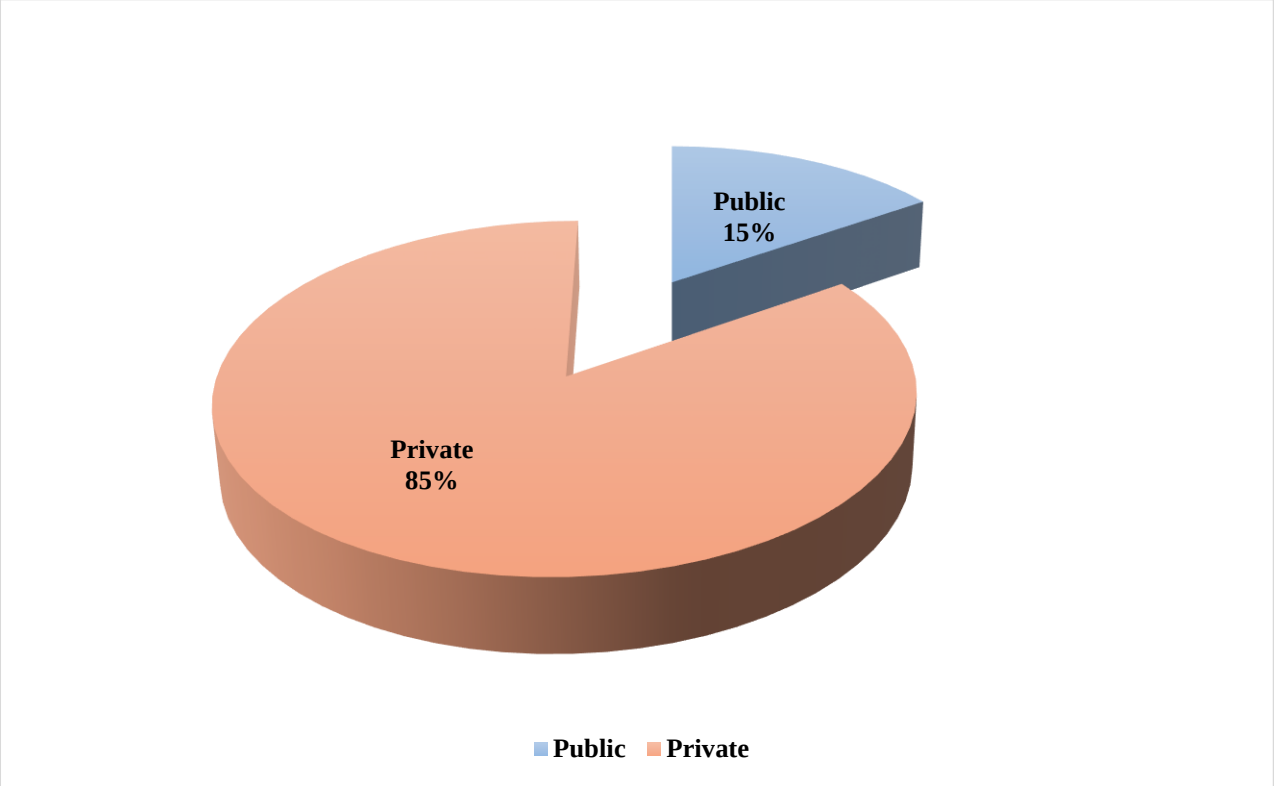

Figure 1.8. Distribution of Institution in Study Population

85% of the population participated in the survey were from private universities and only 15% of the participants were studying in public universities.

4.4. Distribution of Academic Departments in Study Population

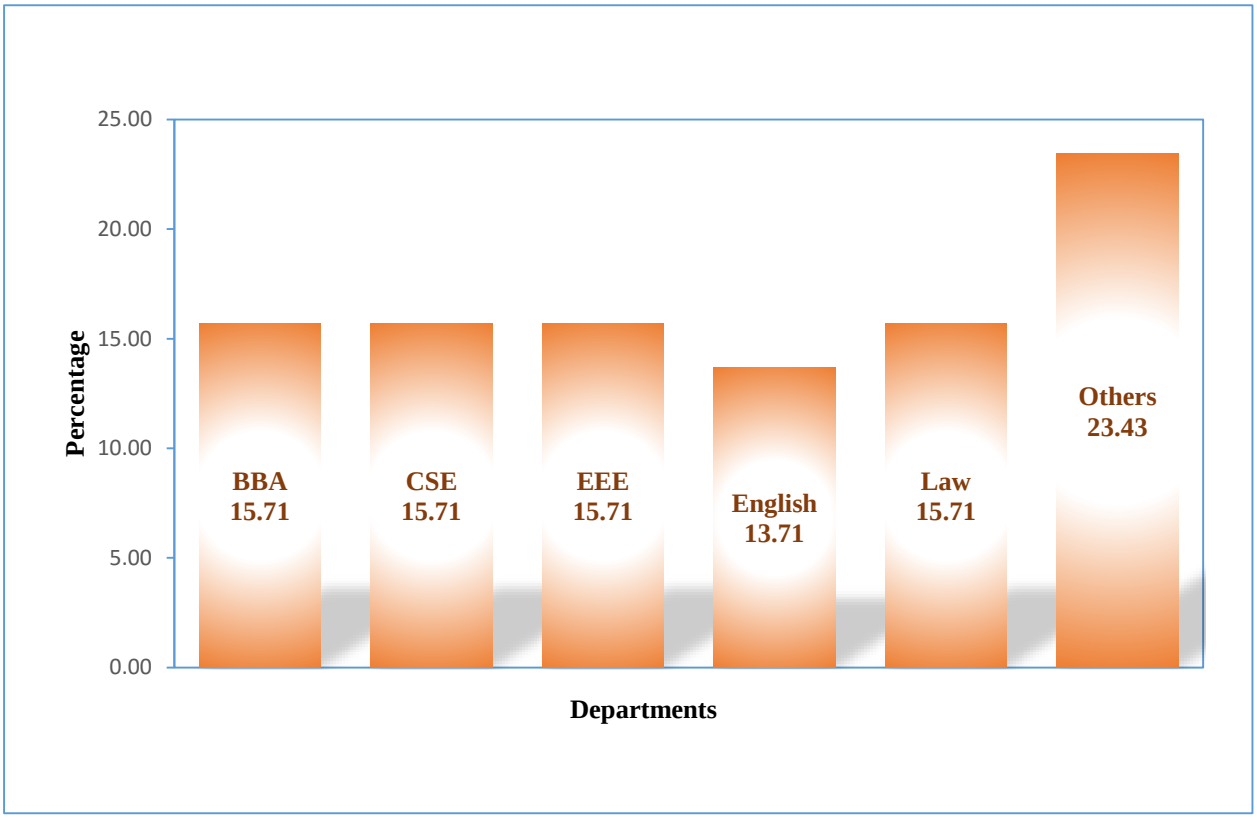

Figure 1.9. Distribution of Academic Departments in Study Population

In the study, equally 15.71% participants were students of Business Administration, Computer Science and Engineering, Electric and Electronics Engineering and Law Departments. 13.71% of the population was from English department and 23.43% were from different other departments like genetics, sociology. Statistics etc.

4.5. Distribution of Marital Status of Study Population

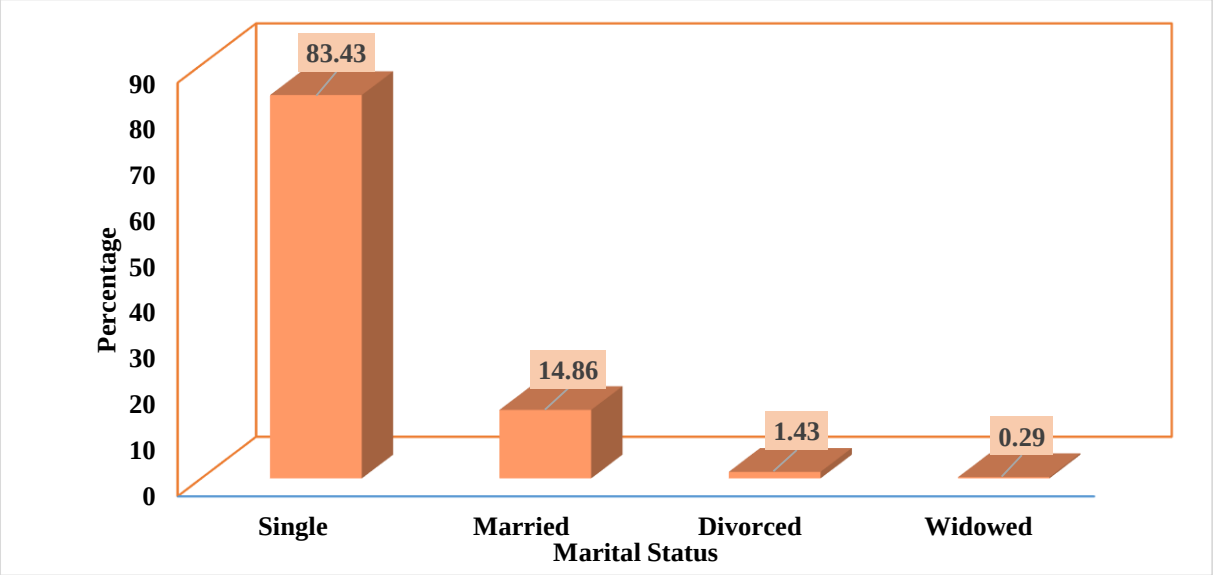

Figure 1.10. Distribution of Marital Status of Study Population

Most of the participants (83.43%) were single in our study. And only 14.86% were married.

4.6. Level of Awareness among Study Population

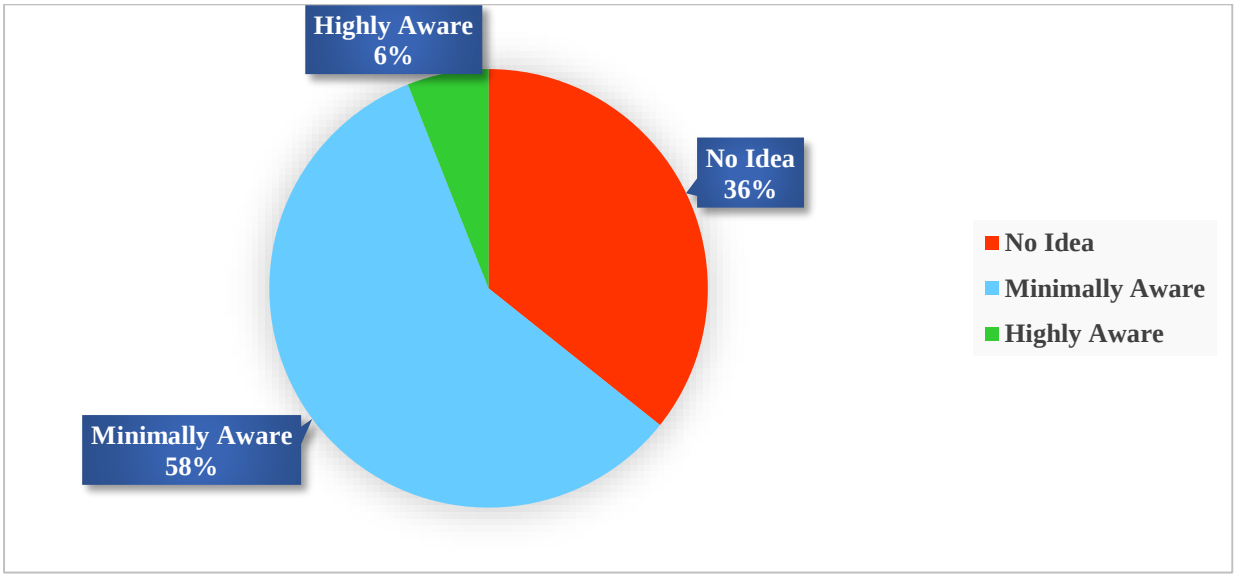

Figure 1.11. Level of Awareness among Study Population

In our survey, we came to know that 36% of the population had absolutely no idea about Polycystic Ovarian Syndrome. 58% have heard the name before and have minimal knowledge about the condition. Only 6% of the study population were highly aware of the reasons and consequences of the condition.

4.7. Perception about PCOS in Study Population

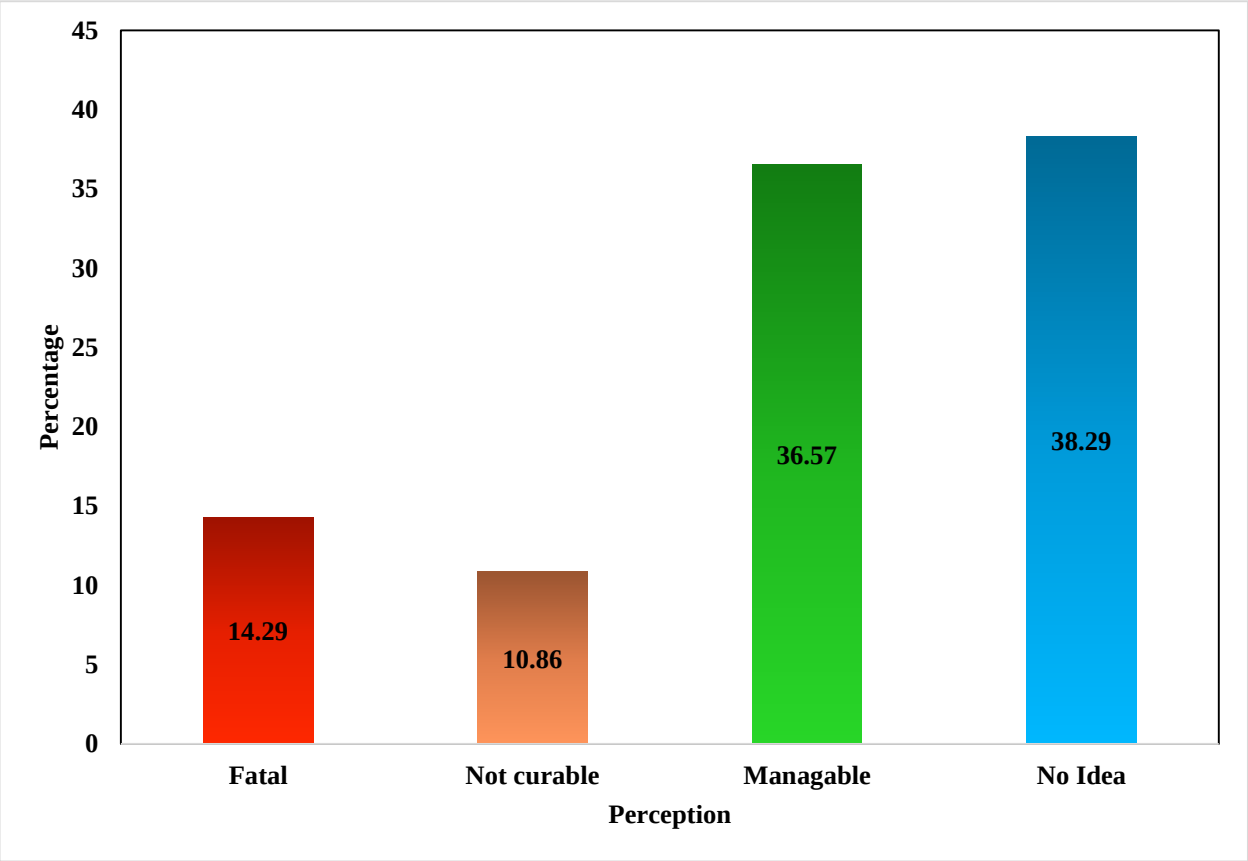

Figure 1.12. Perception about PCOS in Study Population

In our study, we got the idea about what the study population thinks about PCOS. 36.57% of the population considers the condition manageable and 38.29% of them had no idea about the condition. 14.29% of the population denoted the condition as fatal and 10.86% of them thought that it is not curable.

4.8. Knowledge of Signs & Symptoms among Study Population

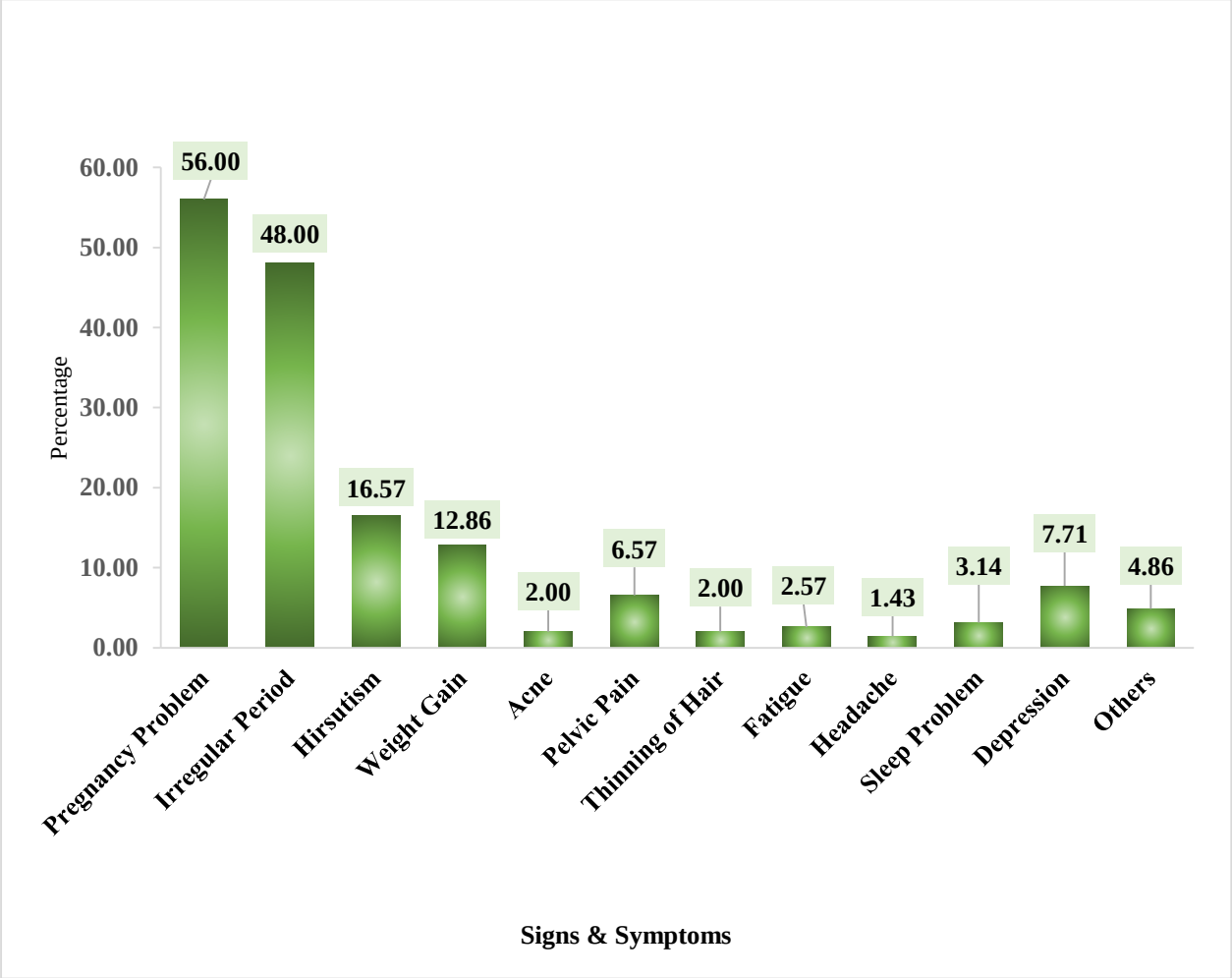

Figure 1.13. Knowledge of Signs & Symptoms among Study Population

We asked the study population about their idea of signs and symptoms of PCOS. Problem in pregnancy and irregular period were selected by 56% and 48% of the population respectively. Whereas only 1.43% people thought headache is a symptom of PCOS.

4.9. Knowledge of Complications in Study Population

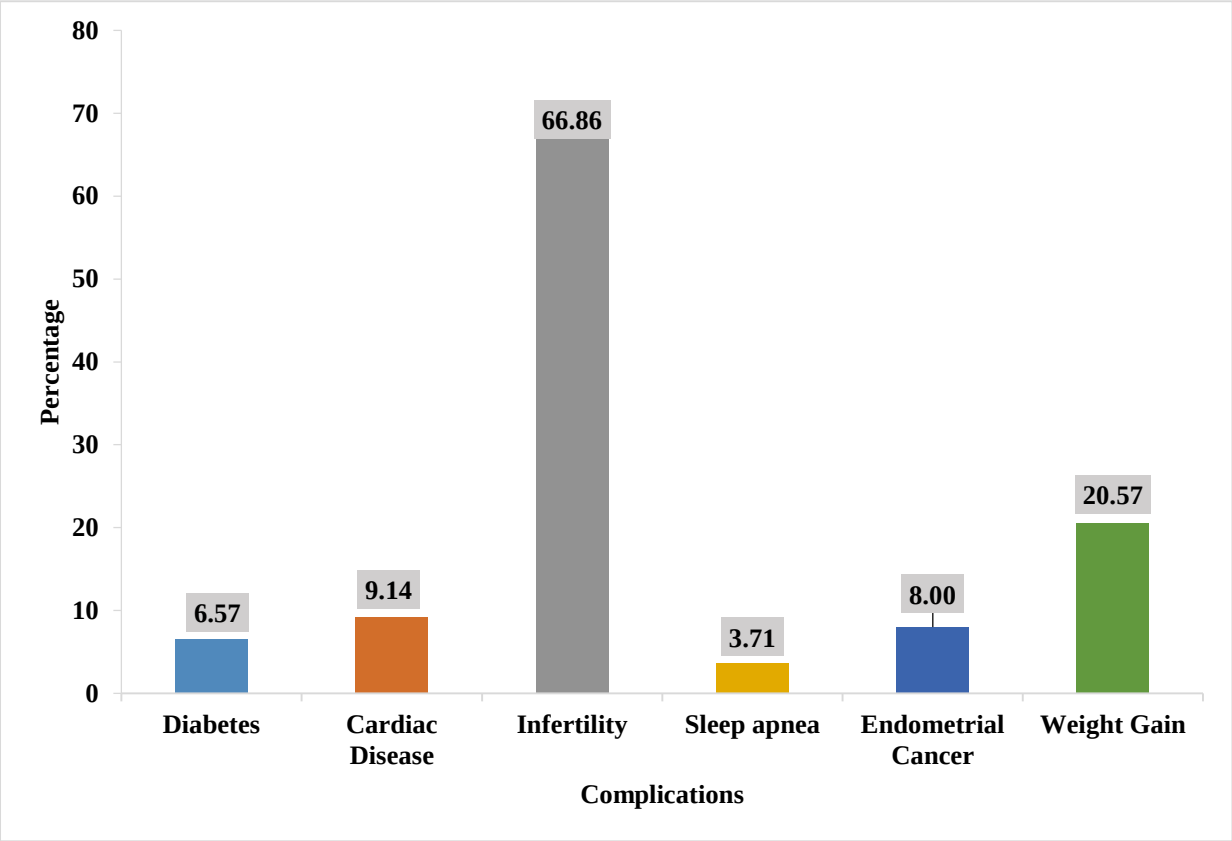

Figure 1.14. Knowledge of Complications in Study Population

Majority of the study population (66.86%) has agreed that infertility is a complication of PCOS. Only 3.71% people selected sleep apnea as a complication of PCOS.

4.10. Distribution of Population Diagnosed by PCOS

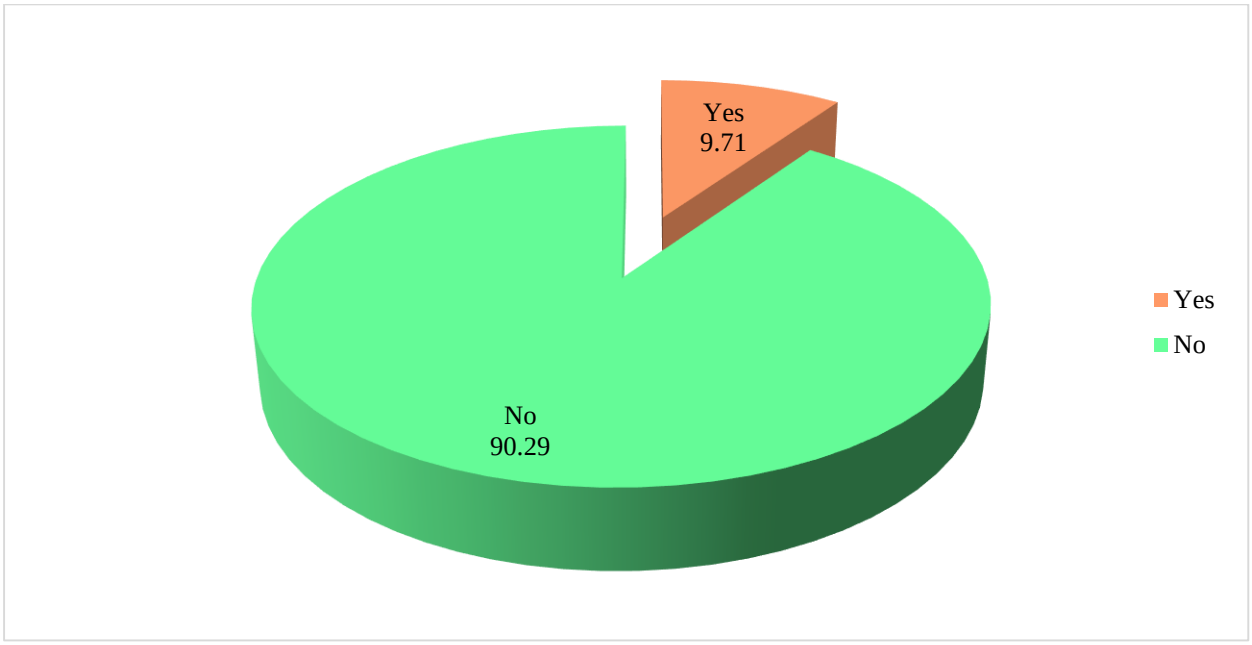

Figure 1.15. Distribution of Population Diagnosed by PCOS

In our study, we found out, 9.71% of the study population was diagnosed by PCOS whereas the other 90.29% of the population was not diagnosed with PCOS as of their knowledge

4.11 Family History of PCOS within the PCOS Diagnosed Population

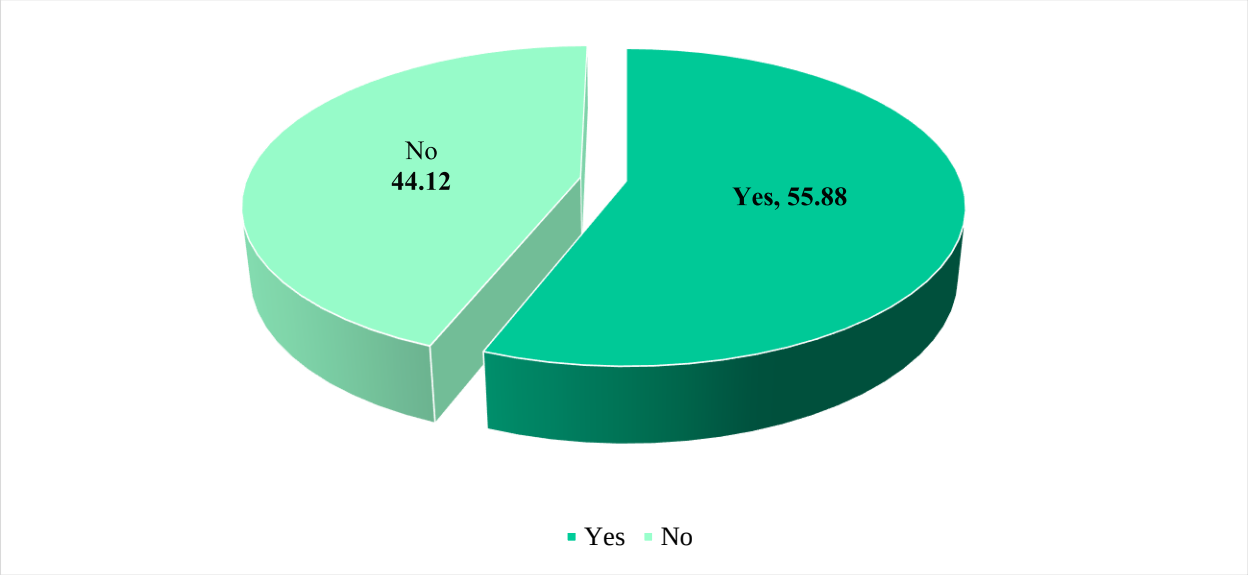

Figure 1.16. Family History of PCOS within the PCOS Diagnosed Population

Among the population who had PCOS, 55.88% of them had family history of PCOS, which means their mother, sister or any other female family members already had PCOS. 44.12% of the PCOS patients did not have any heredity of PCOS.

4.12 Diagnosis Method of the PCOS Patients

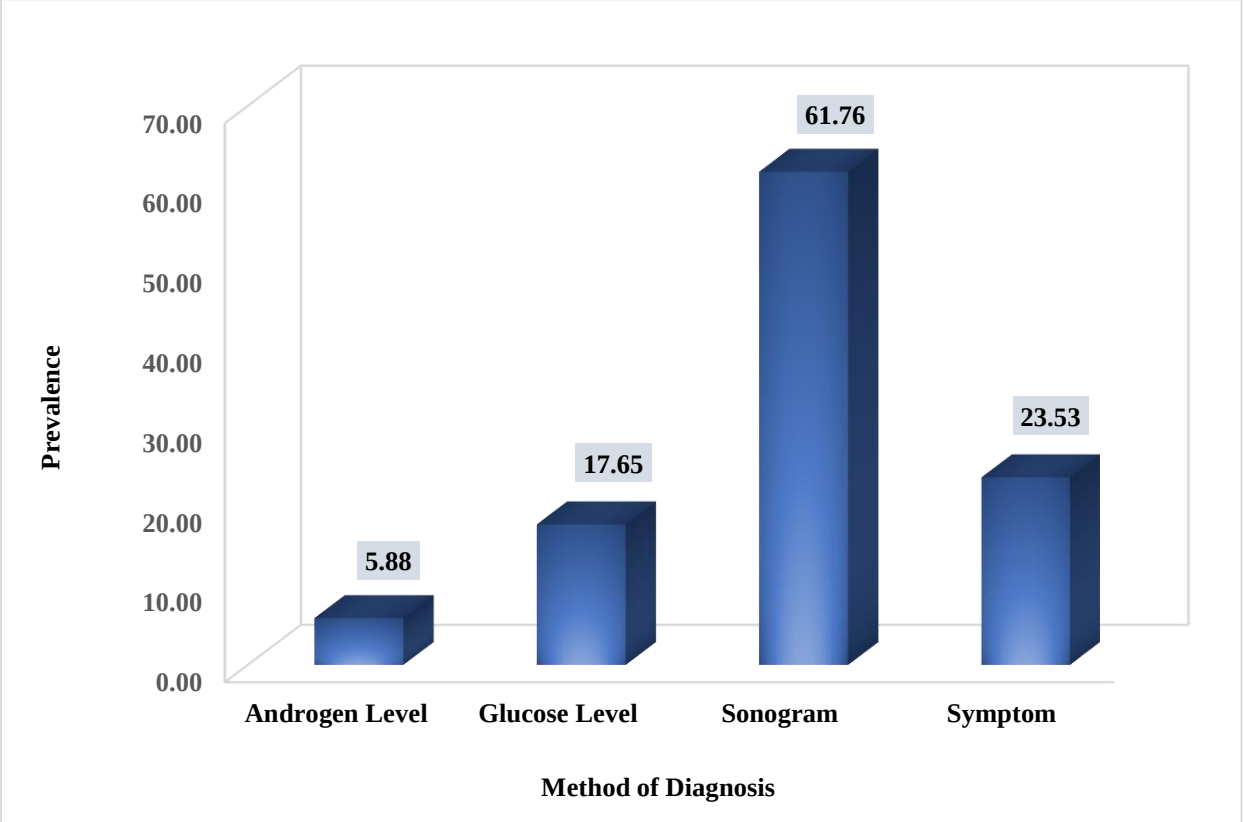

Figure 1.17. Diagnosis Method of the PCOS Patients

We asked the PCOS patients how they were diagnosed to have PCOS. 61.76% of them found out with ultrasonography. 23.53% were diagnosed by symptoms. Very few of them were diagnosed by Blood androgen level and glucose level (respectively 5.88% and 17.65%).

4.13 Feelings towards Having PCOS

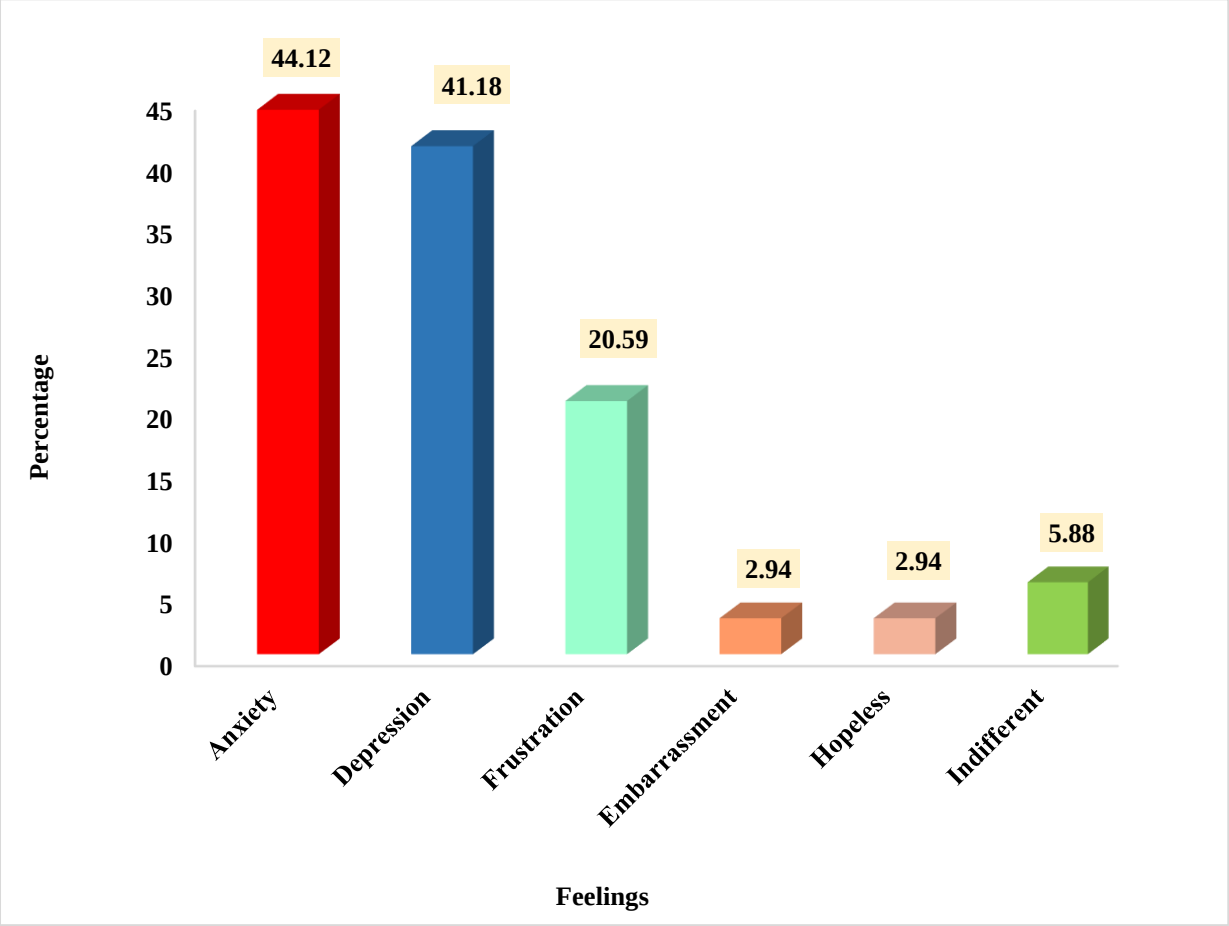

Figure 1.18. Feelings towards Having PCOS

The PCOS patients had mixed feelings about dealing with the condition in their daily life. 44.12% were anxious about their menstrual irregularity and future possible pregnancy complications. 41.18% of the study population said they were already depressed about it. 20.59% of them were very frustrated for dealing with it every day.

4.14. Undergoing Treatment

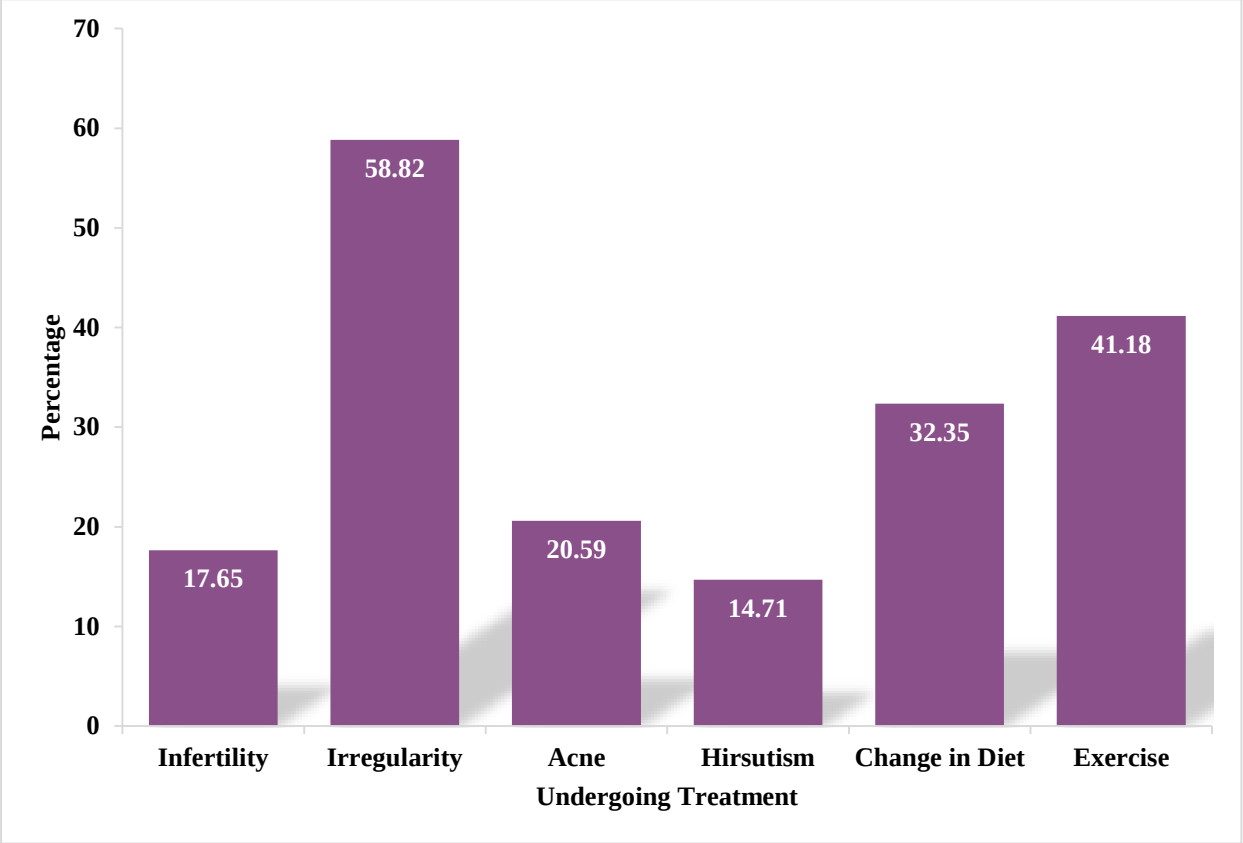

Figure 1.19. Undergoing Treatment

The 34 patients we found to be diagnosed by PCOS were undergoing different treatment methods to manage the condition. 58.82% were taking medications for menstrual irregularity. 32.35% and 41.18% went through change in diet and incorporate exercise in daily life respectively.

4.15 Source of Information about PCOS

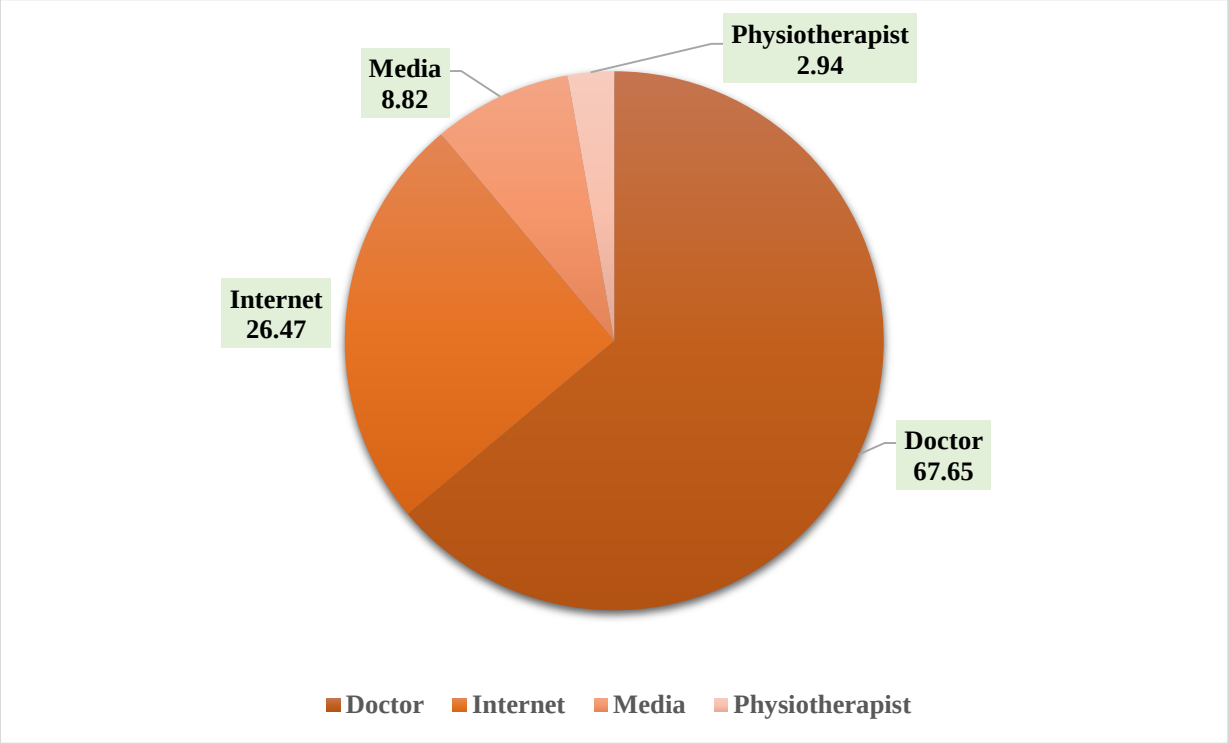

Figure 1.20. Source of Information about PCOS

The population diagnosed by PCOS definitely had more knowledge than the general population about polycystic ovarian syndrome. About the source of information, 67.65% had information from their doctors. 26.47% educated themselves through internet. 8.82% got the information from media and 2.94% were informed by their physiotherapist.

4.16. Risk Factors under Check by PCOS Patients

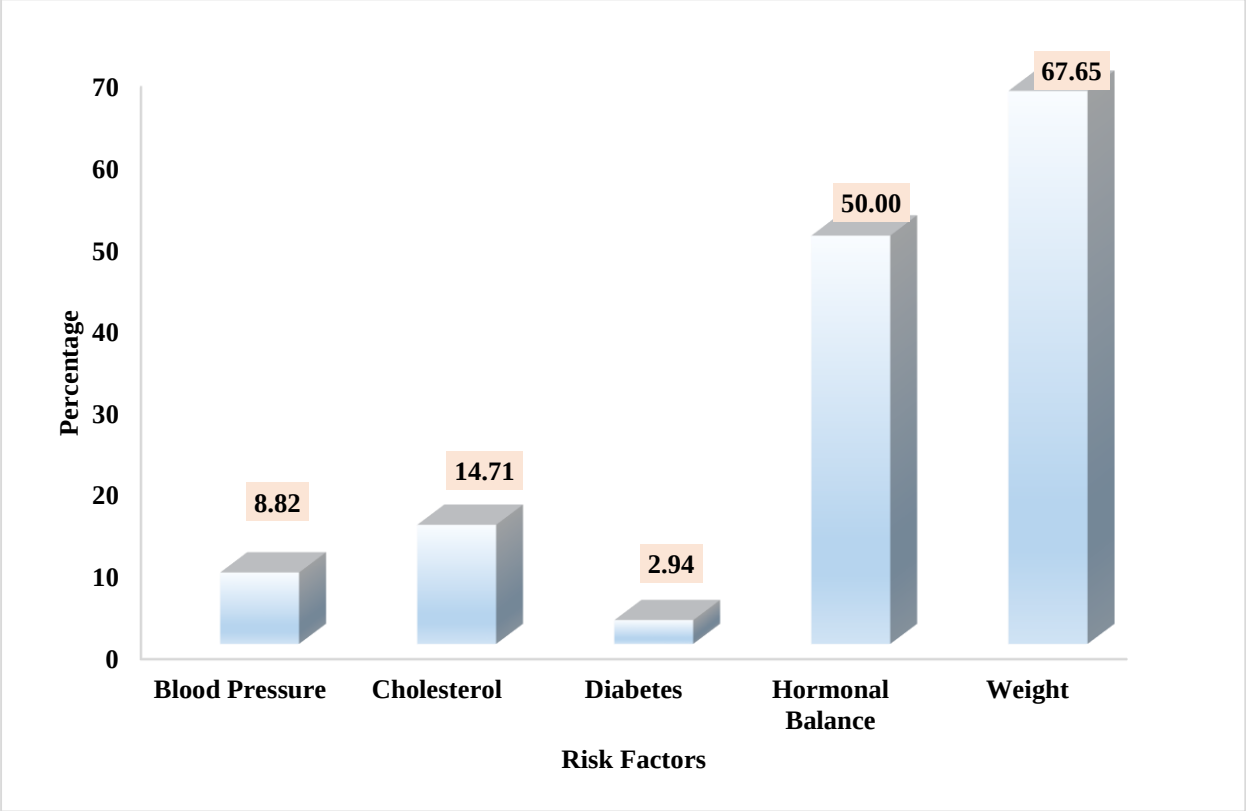

Figure 1.21. Risk Factors under Check by PCOS Patients

We asked the population diagnosed by PCOS what risk factors did they kept under check. 67.65% kept their weight under control and 50% did regular check on hormone profile. Only 2.94% kept their diabetes checked.

4.17 Junk Food Consumption by PCOS Patients

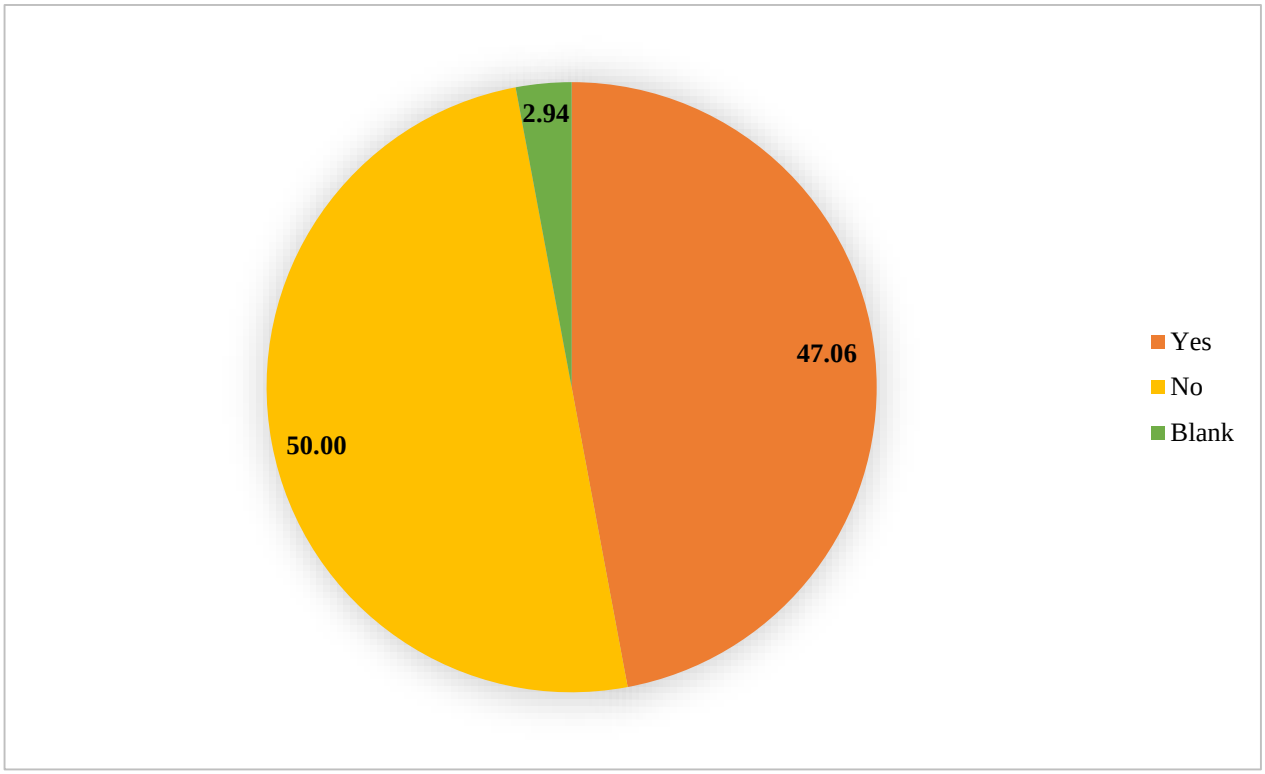

Figure 1.22. Junk Food Consumption by PCOS Patients

In our study, 50% of the PCOS patients said they did not consume too much junk food. However 47% of them did consume junk food which indicates their indifferent attitude towards the condition.

4.18. Water Consumption by PCOS Patients

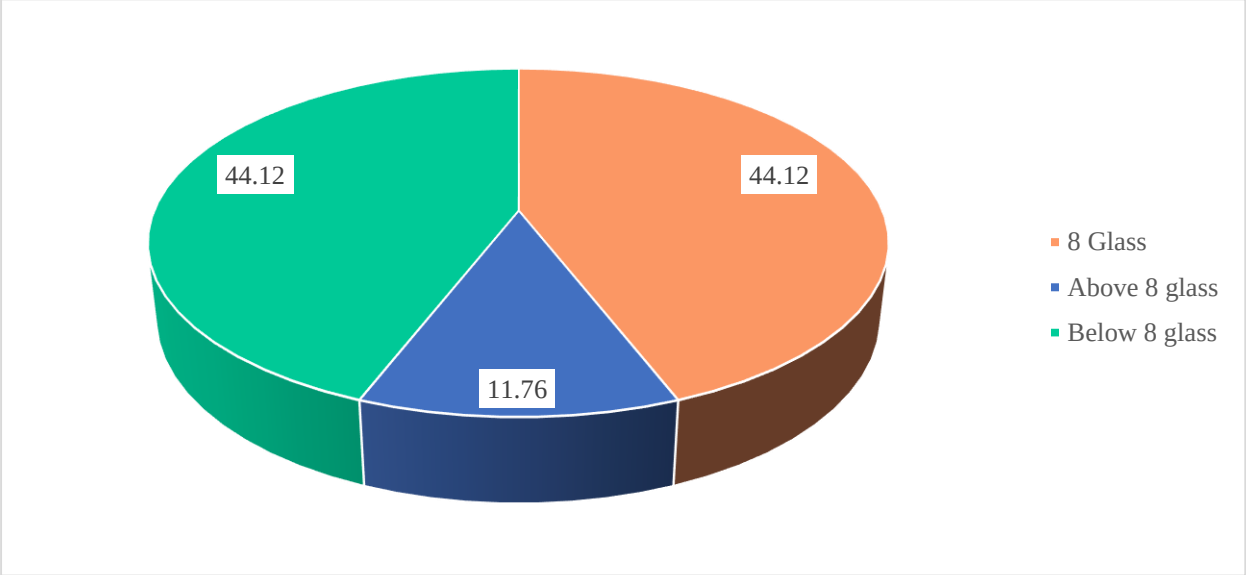

Figure 1.23. Water Consumption by PCOS Patients

The percentage of water consumption below 8 glass and 8 glass were equal e.g. 44.12% 11.76% drank more than 8 glasses of water.

4.19. Knowledge about Healthy Food in Managing PCOS

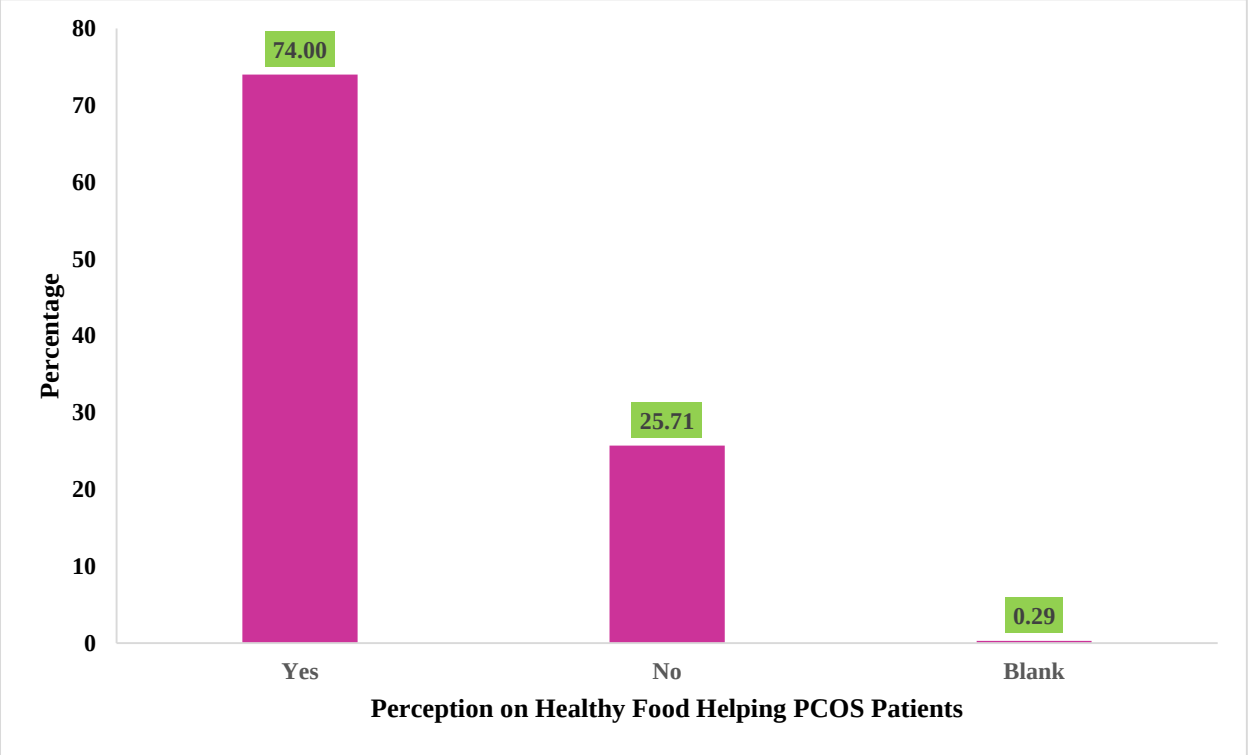

Figure 1.24. Knowledge about Healthy Food in Managing PCOS

In our survey we asked the participants if they thought healthy food can help patients having PCOS. 74% agreed and 25.71% disagreed that healthy food might play an important role in managing PCOS.

4.20. Knowledge about Foods to Avoid in Managing PCOS

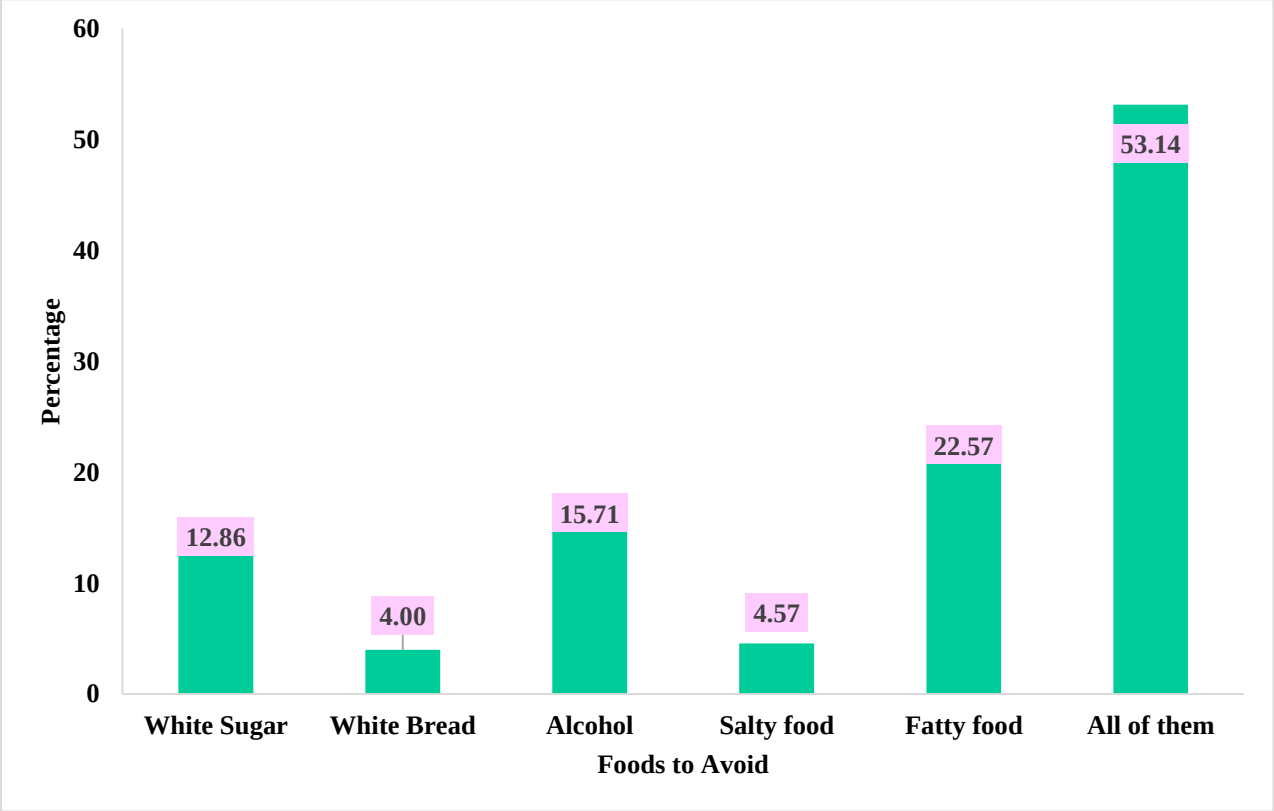

Figure 1.25. Knowledge about Foods to Avoid in Managing PCOS

In the survey, 53.14% of the population agreed that patients with PCOS should avoid all of the items in the list provided which included white sugar, white bread, alcohol, salty food, fatty food.

4.21. Perception about Exercise in Managing PCOS

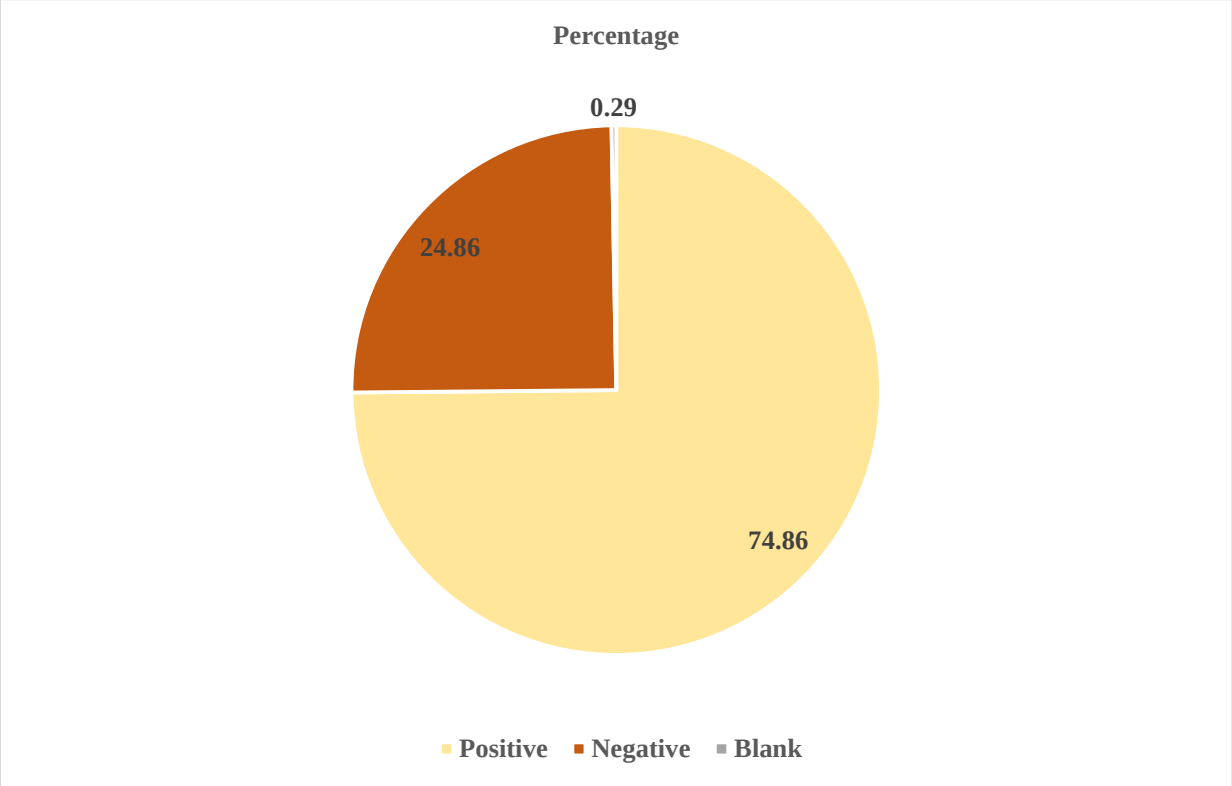

Figure 1.26. Perception about Exercise in Managing PCOS

We wanted to know the perception of the participating population towards exercise in managing PCOS. 74.86% said exercise can help PCOS patients whereas 24.86% did not agree with it.

4.22. Knowledge about the Benefits of Exercise is Managing PCOS

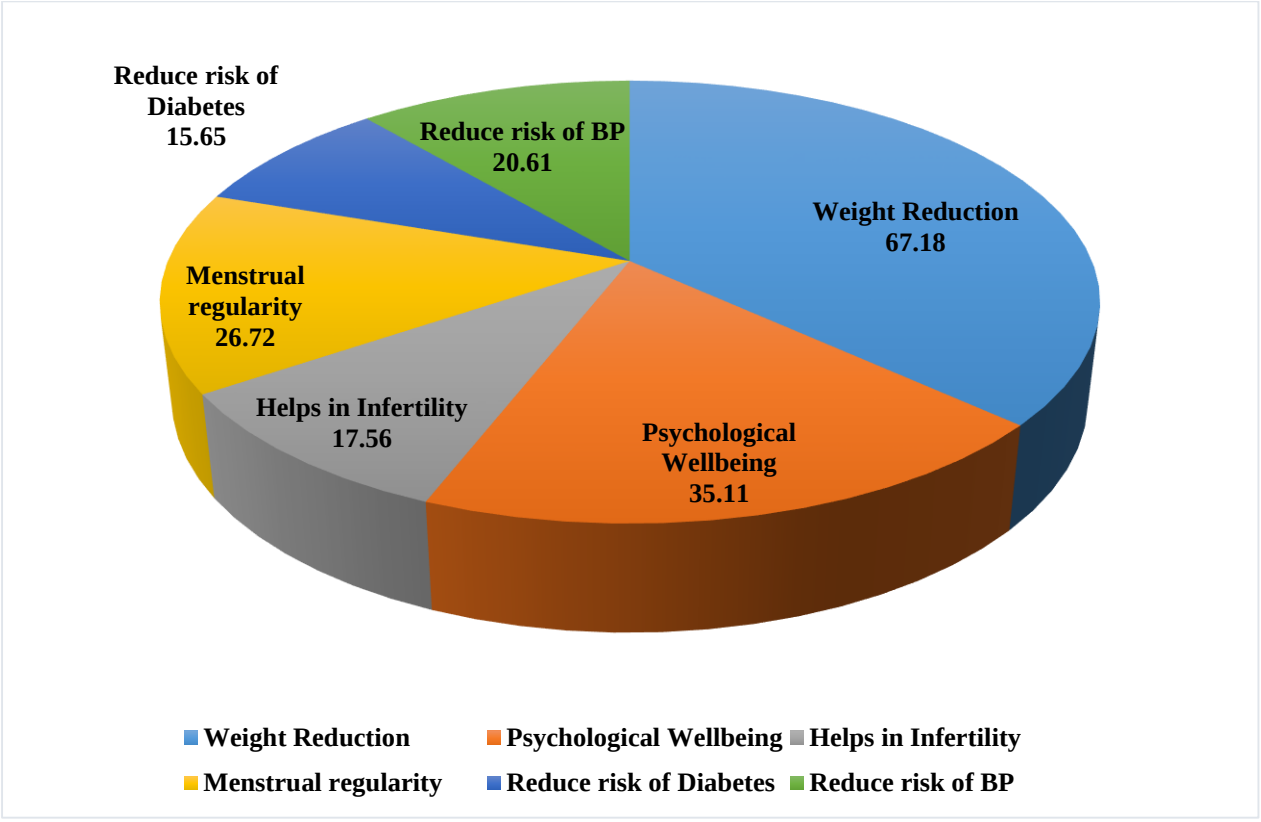

Figure 1.27. Knowledge about the Benefits of Exercise is Managing PCOS

67.18% of the population said that exercise helps in weight reduction. 35.11% agreed that it helpful in psychological wellbeing. Only 17.56% selected exercise as a beneficial measure for infertility.

4.23. Perception on the Refraining Factors of Exercise

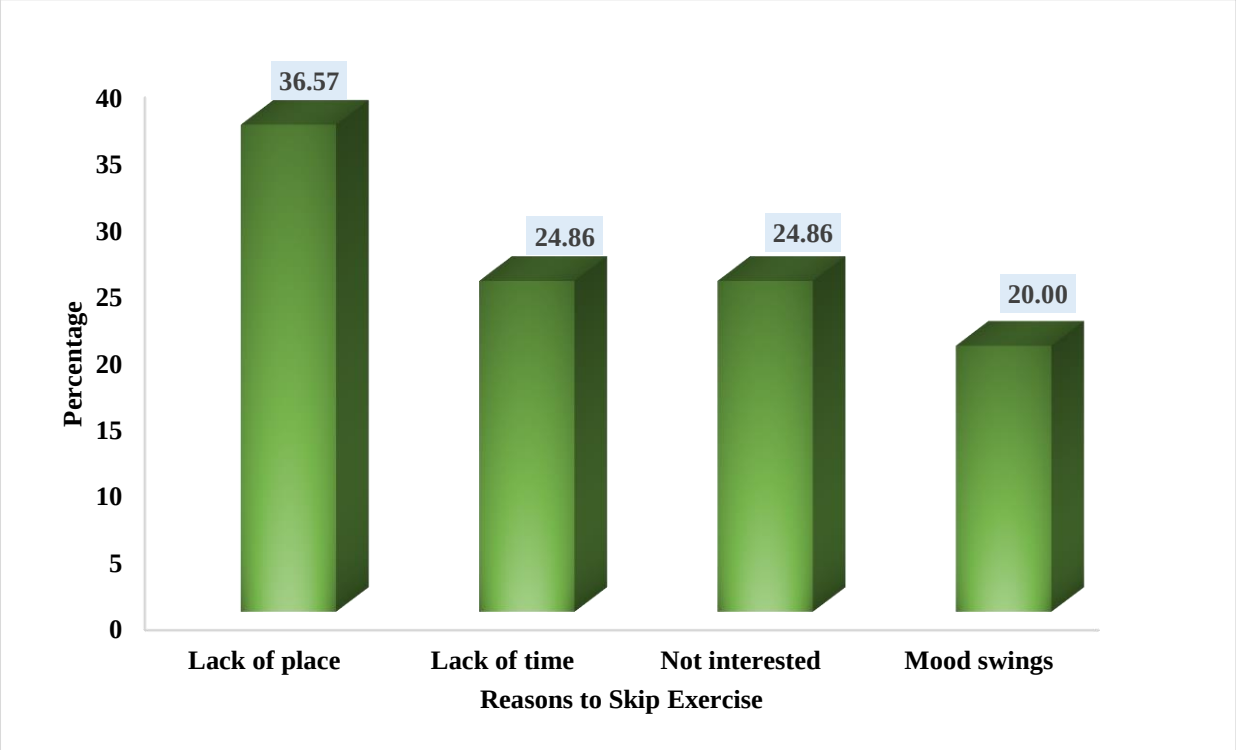

Figure 1.28. Perception on the Refraining Factors of Exercise

In our study, we asked the participants why they think people skip exercise. 36.57% said lack of proper place is a reason for not doing exercise. The other refraining factors were lack of time (24.86%), no interest (24.86%) and mood swings (20%).

4.24. Knowledge of Treatment Methods in Managing PCOS

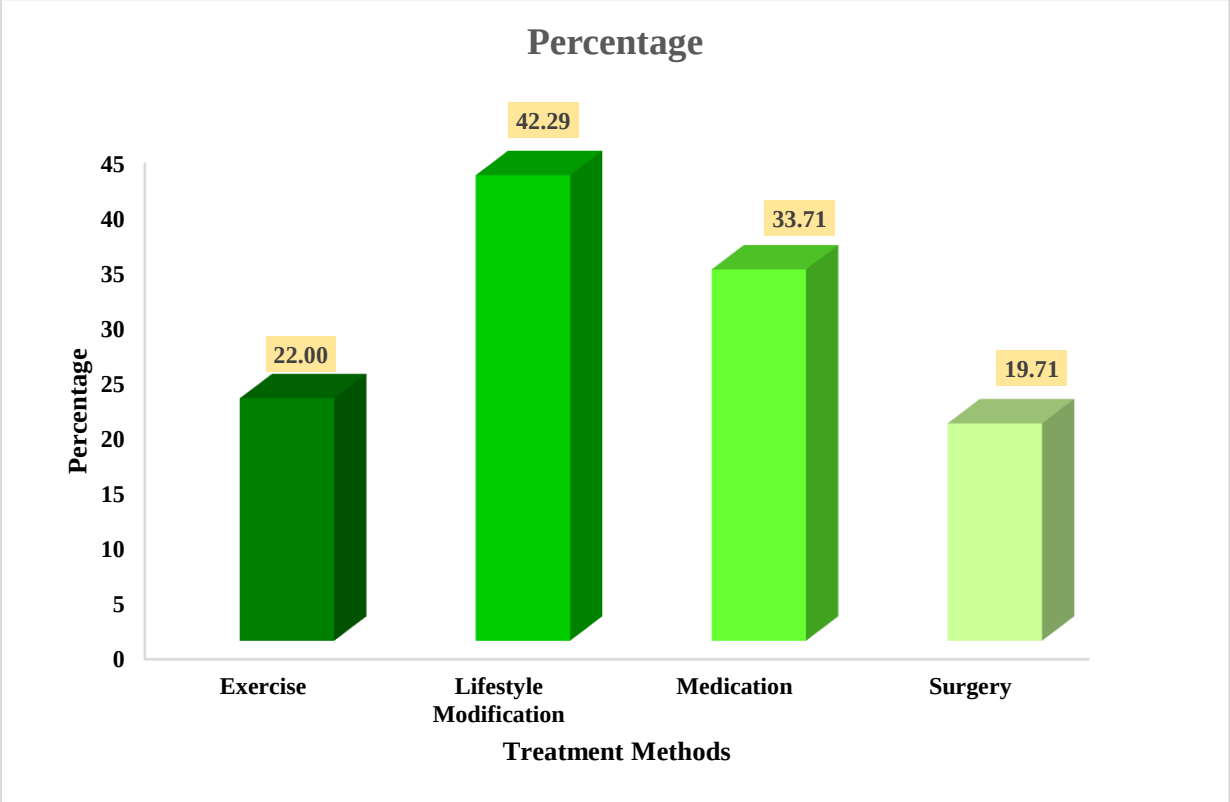

Figure 1.29. Knowledge of Treatment Methods in Managing PCOS

In our study, we wanted to know the participants perception on treatment options of PCOS. 42.29% selected lifestyle modification as the first choice of treatment in PCOS. 22% people think exercise is a treatment option. 33.71% people said medication should cure the condition. 19.71% thought surgery would help the patients with PCOS to get rid of the condition.

5.1. Discussion:

In the present study, we surveyed the knowledge among 350 students of public and private universities in Dhaka (Dhaka University, East West University, North South University, Ahsanullah University of Science & Technology) about Polycystic Ovarian Syndrome, particularly on common symptoms, complications, diagnosis methods, source of knowledge, management and treatment options, influence of exercise an food upon PCOS, feelings and perception about the condition

In our study women were aged between 20-27 years old, 20.86% were in 18-20 age group, 39.43% were in 21-22 age group, 30.57% were aged in between 23-24 and 5.14% were in 25-27 age group. Some of the participants did not want to mention their age. The missing data for age group is 6.86%. Participants were studying in different departments such as EEE, CSE, English, BBA, Pharmacy etc. Majority of the participants were single (83.43%) and 14.86% were married with a minimal number of participants being widowed and divorced.

In our study, 58% have minimal knowledge about the condition. Only 6% of the study population were highly aware of the reasons and consequences of the condition. A survey on symptoms and awareness of PCOS in urban Pakistani women found that only 10% were familiar with PCOS, which is inconsistent with our study. (Ansari et al., 2014) Another study performed in Nitte Usha Institute of Nursing Sciences found 76% had average knowledge and 10.7% had good knowledge about PCOS. (Sabitha & Sunanda. 2016) The percentage of acquaintance is a little bit higher than our value. In a study performed in a Semi Urban School of Sambalpur, India, it was identified that 78% students never heard of PCOS before which is inconsistent with our value. (Hansa et al. 2016) In a study in Tertiary Care Hospitals of Pakistan, 55.6% patients were found to be unaware about PCOS (Abbas et al., 2014) which is far different than our value. A survey in Mumbai performed on women visiting gynaecological clinics showed that 6% of the participants considered themselves as not at all aware about PCOS, which is opposite to what we found in our study. (Pitchai, Sreeraj & Anil, 2016)

The previous study of Mumbai also showed 81% participants think PCOS is manageable. (Pitchai, Sreeraj & Anil, 2016) On the other hand in our study 36.57% expressed that it is a manageable condition. So in this particular matter the results are a little bit different.

Our study showed participants' perception on the signs and symptoms of PCOS. 56% of the population selected difficulty in pregnancy and 48% said irregular period. Above study showed that 20% people assume PCOS causes difficulty in pregnancy and 30% think irregular period as some of the signs and symptoms of PCOS. (Pitchai, Sreeraj & Anil, 2016)

Our study revealed that among 350 students of different universities, only 34 (9.71%) were diagnosed by PCOS. Among them only 23.53% were diagnosed by symptoms. In contrast with this a study among science students of different universities in Pakistan found that 3.5% of 374 students were diagnosed with PCOS by signs and symptoms. 17.5% of the population were suspected to have the risk of PCOS. (Haq et al., 2017) So we can say even though our study showed a higher rate of prevalence of PCOS among students, the study in Pakistan exhibited a higher rate of risk zoned population.

In our study, among PCOS patients 67.65% of the population had information from their doctors. 26.47% educated themselves through internet. A study performed on polycystic ovarian syndrome in adolescents in Rotterdam showed that 11.5% of the population got knowledge from a doctor and 5% learnt from the internet which is far less than our value. (Jayshree et al, 2017) In another study in Mumbai, India the respondent's main source information about PCOS was doctor and internet which account for 51% and 22% respectively. This study data is similar with ours. (Pitchai, Sreeraj & Anil, 2016)

A study in Mumbai reveals 32% of the PCOS patient feel anxious as they are not completely aware of what PCOS is and will they ever be able to manage it. 19% feel depressed as the distorted body image and altered quality of life hinder their mental state due to hormonal alterations slipping them into depression in PCOS. (Pitchai, Sreeraj & Anil, 2016) On the contrary, our study shows amongst 34 PCOS patients 44.12% are sufferer of anxiety and 41.18% of depression which is not quite consistent with the study in Mumbai.

A study in India reveal 62% were aware of exercise helping in PCOS, however only half of them did exercise regularly. The subjects that were not exercising regularly especially professionals and students pointed out the reasons behind not exercising. Lack of time was attributed to 33% out of all refraining factors of exercise. (Pitchai, Sreeraj & Anil, 2016) Whereas in our study, we found 74.86% participants agreeing that exercise helps managing PCOS. Upon asking the reasons behind skipping exercise in general, they answered a variety of possibilities. The reasons were lack of time, no interest, mood swings and lack

of place being on the top (36.57%). So we can observe for our population of interest lack of place was a major refraining factor whereas for the study population in Mumbai lack of time was the most significant one.

To determine the knowledge about exercise in managing PCOS we asked our participants to select the benefits of exercise regarding PCOS. 67.18% participants thought that exercise helps managing PCOS by weight reduction. 26.72% participants agreed that exercise plays a role in keeping menstrual cycle regular. In contrast to that the study in Mumbai showed benefit in weight reduction and menstrual regularity by the percentage of 42% and 26% respectively. (Pitchai, Sreeraj & Anil, 2016) So we can say even though the data on weight reduction did not match but the percentage on menstrual regularity found in both studies were very close.

About the knowledge of treatment methods of polycystic ovarian syndrome, our study exhibited that most of the participants (42.29%) thought lifestyle modification is the first choice of treatment. On the contrary above study found that lifestyle modification as a treatment option was selected by 24% population which is inconsistent to our study. (Pitchai, Sreeraj & Anil, 2016) Among the other treatment options exercise was chosen by 22% of population in our study. On the contrary, the study in Mumbai reveals 20% people thought exercise is a good treatment option for managing PCOS which is close to our data.

The prevalence of PCOS found in our study was 9.71% whereas the prevalence in Bishop Herber College in Tiruchirappalli City of Tamil Nadu was 7.14% which is very close to our value. (Nivetha et al., 2016)

According to our study results and the studies that are compared to it, we can conclude that more studies are need to be conducted to establish a more clear comparison on various aspects regarding polycystic ovarian syndrome.

5.2. Conclusion:

This study concludes that the level of knowledge about causes, sign & symptoms, possible complications and management of polycystic ovary syndrome is insufficient; we consider it is necessary to improve knowledge about PCOS and upgrading the current health care curricula. From this study we observe that, the level of knowledge about symptoms and complication of PCOS is satisfactory. But populations' knowledge of management is insufficient in most aspects e.g. benefits of exercise, treatment options. PCOS awareness programs should incorporate these aspects with additional focus on management of PCOS. At present it becoming very common condition amongst women in an early age. If they are educated with the preventive measures, the possible prevalence of PCOS in Bangladesh can be decreased. The ministry can also introduce health education at the earliest level regarding PCOS. This is to ensure an early prevention by providing a good understanding on the condition.

Sample of Questionnaire

KNOWLEDGE AND AWARENESS OF POLY CYSTIC OVARIAN SYNDROME AMONG FEMALE NON MEDICAL UNDERGRADUATE STUDENTS

(Department of Pharmacy, East West University)

(All the questions asked are used for research purpose only and all the information is kept confidential) **Place a tick (√) on your choice of answer**

DEMOGRAPHIC INFORMATION

1. Name ***(if interested)***: _____

2. Age: _____

3. Religion: ☐ Islam ☐ Hindu ☐ Buddhist ☐ Christian ☐ Others: _____

4. Education: ☐ Illiterate ☐ Primary school (Class 1 to 5) ☐ High school (Class 6 to 10) ☐ College ☐ University ☐ Others: _____

5. Occupation: ☐ Student ☐ Teacher ☐Business ☐Administration ☐IT ☐ Retired ☐ Housewife

If you are a student, answer question 6-7

6. What department do you study in?

☐ Medical ☐Business Administration ☐CSE ☐EEE ☐English ☐Law ☐Others: _____

7. What kind of institution do you study in? ☐Public ☐Private ☐Mixed

8. Marital status: ☐ Single ☐ Married ☐ Divorced ☐ Widowed

9. Net household income (BDT) : ☐ No income ☐ < Tk 5000 ☐ Tk 5000-10,000 ☐ Tk 10,000-50,000 ☐ >Tk 50,000

Poly Cystic Ovarian Syndrome (PCOS) RELATED INFORMATION

10. What is your level of awareness? ☐Not at all ☐ Minimally aware ☐ Very aware

11. What is your perception about PCOS? ☐ It is a fatal disease ☐ It is not curable ☐ It's manageable ☐ No idea

12. What are the signs and symptoms of PCOS ?

☐ Difficulty in pregnancy ☐ Irregular periods ☐ Abnormal Hair Growth ☐ Weight gain ☐ Acne ☐Pelvic pain ☐ thinning of hair on head ☐Fatigue ☐Headache ☐Sleep problem ☐Depression ☐ Others

13. What kind of complications can result from PCOS? ☐ Diabetes ☐ Cardiac disease ☐ Infertility ☐ Sleep apnea ☐ Endometrial Cancer ☐ Weight gain

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